STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
Honolulu, Hawaii

September 8, 2006

REF:OCCL:DH

File No.: ENF HA-04-08

Board of Land and
Natural Resources
State of Hawaii
Honolulu, Hawaii

BRIEFING

REGARDING:	Conservation District Enforcement File HA-04-08 Regarding Unauthorized Logging of 135 Koa Native Trees, Unauthorized Extraction of Two (2) Ohia Native Trees, Unauthorized Grubbing and Grading, and Unauthorized Skid/Haul Road Construction
BY:	Koa Timber and Hawaii Forest Preservation LLC; Both Owned by Kyle Dong
LAND OWNERSHIP:	Hawaii Forest Preservation, 91-188 Kalaeloa Boulevard, Kapolei, Hawaii 96707
TMK:	(3) 2-7-001:001
AREA OF UNAUTHORIZED USE:	Approximately 4.3 Acres of Skid Roads 13 Total Acres Affected Including Tree Cutting
AREA OF PARCEL:	11,394.80 Acres
LOCATION:	Papaikou and Paukaa Districts, Island of Hawaii
SUBZONE:	Resource

The purpose of the report is to brief the Board of Land and Natural Resources (BLNR) of Koa Timber's compliance and/or non-compliance with the terms and conditions assigned to Enforcement Case HA-04-08.

ITEM K-3

Enforcement Case HA-04-08

On January 9, 2004, the BLNR found Koa Timber to be in violation of HRS, Chapter 183C, and HAR, Chapter 13-5, in 139 instances (tree cutting, grubbing/grading, skid road) and was subject to six terms and conditions. The total fine imposed and paid was **$141,000.00** Condition # 4 required that a habitat restoration plan be submitted and executed at Koa Timbers expense (**Exhibit 1**).

Koa Timber Habitat Restoration Plan

On May 27, 2004, Koa Timber submitted the Habitat Restoration Plan to reforest the affected area for Enforcement Case HA-04-08; it was approved by the Chairperson of the BLNR on June 4, 2004, and was subject to eight terms and conditions (**Exhibits 2 & 3**). Three objectives were identified in the Koa Timber's Habitat Restoration Plan:

Objective 1: Koa Timber must restore the native habitat of the lands "damaged" in conservation district of Paukaa

Six acres of the severely impacted 13 acres were to be restored adjacent to road grades that contained few or no trees. Koa Timber would provide a buffer approximately 10 feet from road grade edges – *exclusive from the buffered road system.* However, DOFAW estimated that while 5.8 acres was treated, 1.9 acres was located within the skid road system, and 3.9 acres or 65% was outside the buffered skid road system. Staff notes only 3.9 acres of the six acres was treated which falls short of the required six acres of the Habitat Restoration Plan.

Koa Timber was to use 48 test plots over various terrain including roadways and un-canopied areas to research and monitor koa regeneration, employing various treatment combinations of herbicide and surface scarification methods. However, Koa Timber only used 30 test plot sites, or met 63% of its stated goal. Staff notes that only 63% of the stated objective by Koa Timber was reached. Lastly, the test plots were treated once upon installation but did not receive follow-up treatments and monitoring due to budgetary constraints.

Objective 2: Koa Timber will remove exotic and invasive species growing in the conservation district of the Paukaa area

Koa Timber was to remove exotic or remove invasive species from the mitigation treatment areas by using mechanical removal and herbicide application. The DOFAW noted that strawberry guava was controlled in the area.

Koa Timber was to stimulate additional koa regeneration on the order of 200 koa seedlings per acre in the treated area. The DOFAW noted that excluding any koa seedlings that presently exist along the road grades, the goal was to have an average of 200 seedling per acre over a period of 3 years - any koa seedlings that previously existed

along road grades were not to be included in the tally. DOFAW noted that a majority of pre-existing koa regeneration in the logged area occurred directly on the skid trails due to stimulation of soil scarification by heavy equipment. The intent of the objective was that new koa regeneration (200 seedlings per acre after summer 2003) should be observed outside the buffered skid road system due to either natural regeneration or as the direct result of Koa Timber mitigation efforts.

Since Koa Timber treated 3.9 acres of which contained an average of 74 recent koa regeneration per acre; Koa Timber met 37% of the stated seedling density objective. DOFAW noted with a figure between 74 to 102 koa seedlings per acre, restoration efforts may lead to the replacement 3.7 to 5.1 mature koa trees per acre in the future, whereas approximately 10.4 mature koa trees per acre were harvested. Staff notes there were beneficial effects but the target levels were not reached.

To summarize the DOFAW report, due to no further mitigation work scheduled and high level of feral ungulates and weed competition, mortality rates in the koa seedlings will be high. Koa regeneration within the buffered road system occurred in densities 4-5 times higher in areas outside the road system. This maybe because Koa Timber representatives mentioned that mechanical and herbicide control efforts were applied twice to the skid road system, but only once to areas outside the skid road system, and a scheduled chemical application treatment was cancelled due to budgetary constraints. In addition, Koa Timber mentioned they did not manage or measure experimental plots due to budgetary constraints.

The initial project budget cap of $20,000 (BLNR approved and stipulated), and an additional $10,000 infusion by Koa Timber were not a sufficient resources to achieve Koa Timbers Habitat Restoration Plan after the two-year period. Staff notes Koa Timber's Habitat Restoration Plan stated goals were not met nor fulfilled.

Objective 3: Koa Timber will comply with the mandated fines imposed by the Board of Land and Natural Resources

Staff notes that Koa Timber was to monitor and report to the Board of Land and Natural Resources (BLNR), for a period of two years to evaluate, the success or failure of the test plots, and prepare a final report for the BLNR by May 2006. Staff notes that although Koa Timber paid all fines, they did not to meet the deadlines imposed by the BLNR[1].

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[1] *Condition # 4. Within two (2) months of the BLNR's decision on this matter, the alleged shall submit, at their own expense, a habitat restoration plan to be approved by the Chairperson:*

A. Upon approval of the habitat restoration plan, Koa Timber shall at its own expense, implement the DLNR approved habitat restoration plan and restore the land within the conservation district to a condition suitable to the Chairperson within one (1) year of approval of the plan or by any other time as determined by the Chairperson;

B. Koa Timber shall prepare a report to be presented to the Board of Land and Natural Resources two years after the Chairperson approves the plan;

- Based on Condition # 4 A, Koa Timber's Habitat Restoration Plan was to be submitted by March 9, 2004 – 2 months from January 9, 2004.
    - The plan was not submitted until May 27, 2004 – 2 ***months late***, due to discussions on what was considered acceptable criteria for the plan between the DOFAW and Koa Timber.

- The 2-month milestone from the date of the Chairperson's approval of June 4, 2004 would have been August 4, 2004.
    - Koa Timber submitted the Koa Timber Inc. Restoration Plan Status Report October 19, 2004 status report on October 19, 2004 - ***2 months late*** **(Exhibit 4).**
    - DOFAW conducted a site inspection and documented their findings in the Two Month Field Inspection of Mitigation Work Conducted by Koa Timber Inc. on Conservation Lands in the Paukaa Area of the Island of Hawaii report, dated November 10, 2004 (**Exhibit 5**).
    - The BLNR was briefed on November 19, 2004.

- The 12-month milestone from the date of the Chairperson's approval would have been June 4, 2005.
    - Koa Timber submitted the Koa Timber Paukaa Mitigation Preliminary Report Version 3 October 19, 2005 status report on October 27, 2005 **(Exhibit 6)** – ***4 months late.***

- The 24-month milestone from the Chairperson's approval would have been June 4, 2006.
    - Koa Timber did not submit the 24-month report.

On June 8, 2006, the OCCL wrote to Koa Timber inquiring about the status of Koa Timber's last report for the 24-month milestone. Staff notes that the department was not able to conduct a site inspection after Koa Timber submitted the 12-month status report due to staff logistics. Recognizing the situation, the department asked Koa Timber's permission to consider using the 12-month status report as their final report, and to use the June 22, 2006 site inspection date as the final site inspection visit (**Exhibit 7**).

Staff would present to the BLNR Koa Timber's 2nd report and DOFAW's 24 Month Field Inspection of Mitigation Work Conducted by Koa Tiber Inc. on Conservation Lands in the Paukaa Area of the Island of Hawaii report (**Exhibit 8**) regarding the restoration efforts by Koa Timber and the resolution of Enforcement Case HA-04-08.

C. If after approval of the habitat restoration plan, the Chairperson determines that alleged has not substantially fulfilled its responsibility to implement the plan, the matter may be considered a continuing violation and subject to a fine of $2,000.00 per day, from a date to be determined by the BLNR based on the facts surrounding BLNR non-compliance;

D. The Habitat Restoration Plan shall not exceed a cost of $20,000.

Staff believed since the Habitat Restoration Plan would be nearing the 2-year deadline, whatever actions undertaken by Koa Timber should be sufficient to show whether they were able to complete the stated goals of the plan.

Conclusion

To summarize, staff feels restoration efforts as outlined in the Habitat Restoration Plan and performed by Koa Timber was not adequate. Staff feels that the Habitat Restoration Plan fell short of the stated goals due to incomplete implementation of planned mechanical and herbicide control applications, and budgetary constraints. Staff notes this is a significant concern as it shows how strongly a forest management plan can be effected by the above factors.

Staff notes it refers the matter to the BLNR to determine whether additional fines should be levied against Koa Timber regarding their compliance with the BLNR's January 9, 2004, Condition # 4, C.

> "If after approval of the habitat restoration plan, the Chairperson determines that alleged has not substantially fulfilled its responsibility to implement the plan, the matter may be considered a continuing violation and subject to a fine of $2,000.00 per day, from a date to be determined by the BLNR based on the facts surrounding BLNR non-compliance."

Respectfully submitted,

Dawn P. Hegger

Dawn T. Hegger
Staff Planner

Approved for submittal:

PETER T. YOUNG, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

Ref.:OCCL:SL

JAN 12 2004

Mr. Kyle Dong
C/o Karen Piltz
Chun, Kerr, Dodd, Beaman & Wong
745 Fort Street, 9th Floor
Honolulu, Hawaii 96813

This is to inform you that on January 9, 2004, the Board of Land and Natural Resources (BLNR) found Koa Timber to be in violation of Chapter 183C, Hawaii Revised Statutes and Chapter 13-5, Hawaii Administrative Rules, and therefore subject to the following:

1. Koa Timber violated the provisions of Chapter 183C, Hawaii Revised Statutes, and Chapter 13-5, Hawaii Administrative Rules (HAR), in 139 instances by failing to obtain the appropriate approvals for unauthorized grubbing and grading; unauthorized skid/haul road construction affecting 4.8 acres; and the destruction of 137 native trees within the conservation district;

2. Koa Timber shall be fined **$8,430.61** for administrative costs associated with the subject violations to be paid within sixty (60) days of the BLNR's action;

3. Koa Timber shall be fined **$141,000.00** for the harvesting and killing of 137 native trees. This fine would include **$2,000.00** fine for the unauthorized skid/haul road, **$2,000.00** for the unauthorized grubbing and grading, and **$137,000.00** the destruction of native trees, to be paid within five (5) months of the BLNR's action, at **$25,000** per month with the balance due as the final payment. The first payment is due by February 8, 2004, followed by a second payment by March 8, 2004, third payment by April 8, 2004, fourth payment by May 8, 2004, and final payment by June 8, 2004;

4. Within two (2) months of the BLNR's decision on this matter, Koa Timber shall submit, at their own expense, a habitat restoration plan to be approved by the Chairperson:

   A. Upon approval of the habitat restoration plan, Koa Timber shall at its own expense, implement the DLNR approved habitat restoration plan and restore the land within the conservation district to a condition suitable to the Chairperson within one (1) year of approval of the plan or by any other time as determined by the Chairperson;

EXHIBIT 1

B. Koa Timber shall prepare a report to be presented to the Board of Land and Natural Resources two years after the Chairperson approves the plan;

C. If after approval of the habitat restoration plan, the Chairperson determines that Koa Timber has not substantially fulfilled its responsibility to implement the plan, the matter may be considered a continuing violation and subject to a fine of $2,000.00 per day, from a date to be determined by the BLNR based on the facts surrounding BLNR non-compliance;

D. The Habitat Restoration Plan shall not exceed a cost of $20,000

5. That in the event of failure of Koa Timber to comply with any conditions, the alleged shall be fined an additional $2000 per day until the order is complied with; and

6. That in the event of failure of Koa Timber to comply with any order herein, the matter shall be turned over to the Attorney General for disposition, including all administrative costs.

Please acknowledge receipt of this letter with the above noted conditions, in the space provided below. Please sign two copies. Retain one and return the other within thirty (30) days.

Should you have any questions on any of these conditions, please feel free to contact me at 587-0381.

Sincerely,

Sam Lemmo, Administrator
Office of Conservation and Coastal Lands

Receipt acknowledged:

_____
Landowner's Signature

Date_____

cc: Chairman
Hawaii Board Member
Hawaii Land Agent
DOCARE/DOFAW
County of Hawaii Planning Department

Koa Timber Inc. Restoration Plan

May 27, 2004

Wade C. Lee M.S. and R.S. Senock, Ph.D.

EXHIBIT 2

Table of Contents

Hawaii Forest Preservation Mitigation Plan

Objective: 1) To restore the native habitat; 2) to remove exotic, invasive species and 3) to comply with the mandated fines and sanctions imposed upon Koa Timber, Inc. by the Board of Land and Natural Resources, to forested land located in Pauka'a, Hawaii.

Hawaii Forest Preservation (HFP) owns 13,000 acres of property that stretches from Pauka'a, through Hakalau on Hawaii Island. Most of the land is forested and is in the Conservation District, Resource(R) sub-zone. Koa Timber, Inc. through an agreement with HFP logged on the site and will be responsible for the implementation of the restoration work. The thirteen acres of land is in a site that has been degraded by logging and heavy equipment activity dating back to April, 1932. Prior to logging, the area was in heavy sugar production and was the location of Onomea Sugar Company's extensive surface water ditch system. As directed by the Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW) the restoration efforts will be restricted to the removal of exotic plants while fostering the reproduction and survival of native species. The restoration plan will also clear an existing trail system that will allow hunters access onto the property by removing the strawberry guava that has made the trail system impassable by humans. The area contains a large wild pig population that is primarily responsible for the uncontrolled spread of strawberry guava. It is HFP's belief that if hunters have access to the forest, they will help to control the pig population and reduce the continual spread of strawberry guava, through the use of traps as well as dogs.

I. Method

Objective 1: Koa Timber must restore the native habitat of the lands "damaged" in conservation district of Pauka'a.

It was agreed that Koa Timber will clear and restore approximately six acres of land in the conservation district after frank discussions with the DLNR, Office of Conservation and Coastal Lands (OCCL) and the(DOFAW). This decision was based on the several factors. A key component is the cost versus benefit analysis made of reforesting and clearing the land of invasive and exotic species. Based upon a previous forest management plan, DLNR felt that Koa Timber should implement control and test plots to monitor and analyze the re-growth of koa seedlings. The cost of a 13 acre test site was exorbitant. When discussing the cost of implementing a test site program, it was decided that it was more beneficial to keep the test site to six acres rather than the full 13 acres described in the sanctions imposed by the BLNR. A better plan using the capped budget of $20,000 could be used on six acres with follow up monitoring, than just land clearing over 13 acres.

Of the approximately six acres of land, restoration work will begin in areas that was severely impacted by logging operations that are adjacent to road grades that presently contain few or no trees. Koa Timber will include a buffer of approximately ten (10) feet from road grade edges. Additionally, the following methods will be applied to achieve Objective 1.

A. Restoration Area: Work will be allocated to areas impacted by prior logging operations that are adjacent to road grades that contain few or no trees. A ten (10) foot buffer from road grade edges will be used in areas that are already showing koa regeneration.
B. Test Plots: Koa Timber will establish test plots over various terrain including roadways and un-canopied areas. Control plots and sites treated with herbacide or scarified will be assessed and monitored.
C. Data collection and Analysis: Koa Timber will collect data to determine the effects on seedling germination, survival rates and height growth.
D. Post-emergent Tests: Koa Timber will test the effect of longevity of post-emergent chemical treatment on exotic and invasive species.
E. Scarification Analysis. Koa Timber will test and analyze the effects of scarification treatment on new koa seedling germination and site preparation.

Objective 2: Koa Timber will remove exotic and invasive species growing in the conservation district of the Pauka'a area.

The removal of invasive species will include but not be limited to Strawberry Guava (*Psidium cattleiam* Sabine) from all pathways in the conservation resource district. The removal of the invasive species will be accomplished using the following method.

A. Mechanical Removal. Chainsaws and weed whackers will be used initially to remove the invasive species. No native species will be removed.
B. The debris will be cut and stacked to expose as much surface soil to sunlight as possible to encourage Koa regeneration.
C. Triclopyr at 13% concentration will be applied using backpack sprayers to stumps and young weeds not more than 12" tall. Triclopyr has proven to be effective in controlling the strawberry guava in this area by the studies conducted on the property in 2001 and 2002 (see Addendum B).
D. Regeneration of Koa will be encouraged by tilling the top 3 inches of soil where adequate direct sunlight >30% daily is available. The tilling will be done with garden rakes and hand held hoes. Excluding any koa seedlings that presently exist along road grades, the goal for the regeneration of Koa is to have an average of 200 seedlings per treated acre over a period of three years.
E. Hunters will be allowed to hunt on the property using dogs and traps.
F. All endangered and/or threatened species identified will be mapped and fenced when practical for protection from pigs and hunters.

Objective 3: Koa Timber will comply with the mandated fines imposed by the Board of Land and Natural Resources.

Koa Timber will continue to monitor and report to the Board of Land and Natural Resources (BLNR), for a period of two years, the success or failure of the test plots, and a final report will be made to the BLNR by May 2006. To complete Objective 3, Koa Timber will submit reports and include as much information as may be substantiated, at the time that the report is submitted.

A. Koa Timber will submit interim reports to the OCCL and DOFAW at the two and twelve-month periods and a final report at the end of 24 months.
B. The initial two-month report to the DLNR will include a map that will be submitted to the OCCL and DOFAW detailing the cleared areas, road systems and areas where the restoration plan will be implemented.
C. Each of the reports will include detailed information on the progress of the restoration work, an explanation of the methodology used, timelines, budget information, any test results, i.e., survival rates, measure growth etc., photos, and any other pertinent information.

II. Materials and Budget:

At the Board of Land and Natural Resources January 12, 2004 land meeting one of the terms and conditions was that the implementation of a reforestation plan would cost no more than $20,000. To begin the program, various equipment and chemical(s) will need to be purchased. An estimated total cost of $21,014.00 will be spent for materials and labor costs. (See below)

2	Shindaiwa Weed Whackers	$650.00 x 2	$1,300.00
6	Blades	$35.00 x 6	$210.00
2	Stihl Chainsaws	$600.00 x 2	$1,200.00
2	Backpack Sprayers	$103.00 x 2	$206.00
2	3-gal Containers of Garlon 3A	$312.00 x 2	$624.00
1	Hours of KS Helicopter Time	$750.00 x 1	$750.00
3	Garden Rakes	$31.00 x 3	$93.00
3	Garden Hoes	$27.00 x 3	$81.00
500	Hours of Labor	$18.00 x 500	$9,000.00
	(includes taxes, insurance, administration & payroll)		
1	Professional Forester Supervisor	$4,000.00 x 1	$4,000.00
Reports & Restoration Planning			$2,550.00
Misc. Expenses			$1,000.00
Total Budget			$21,014.00

III. Timeline:

The program as outlined is scheduled to begin upon the approval of the plan from the Chairman of the BLNR. Koa Timber will submit a letter of completion to the DLNR, OCCL and DOFAW, when all phases of the plan have been completed.

Koa Timber will continue observations to assess the success or failure of natural Koa regeneration at 12 and 24-month periods (*see Objective 3*). Follow up reports will be made to DOFAW, as well as the OCCL within three weeks of these observations. A final report will be given to the OCCL and DOFAW, and will be presented to the Board of Land and Natural Resources at the conclusion of the 24-month period.

IV. Conclusion:

This mitigation plan will be completed within one month from its start date. Once completed, Koa Timber, Inc., will continue to monitor the re-growth of koa as well as monitor the re-growth of invasive species in the cleared areas. The successful regeneration of koa is incumbent upon the careful monitoring of invasive species. It is the goal that the implementation of this plan will result in the successful growth of koa that will aide in the restoration the natural native habitat to the area.

In Addendum A, Dr. R. J. Senock describes a comprehensive project evaluation and recommends suggested priorities for a management follow-up plan. It is important to note under his analysis, that the need for continuing, periodic measurements must be weighed against the large financial and commitment costs involved, which should be considered when evaluating this mitigation plan.

V. Department of Land and Natural Resources (DLNR) Criteria

DOFAW will conduct site inspections of the subject parcel in the 2, 12, and 24 month period after receiving Koa Timbers reports and before Koa Timbers presentations before Board of Land and Natural Resources (BLNR) scheduled land meetings. Koa Timber should submit their reports within 3 weeks of the 2, 12, and 24 month milestones, and site inspections will be within 3 weeks of these submissions

During inspections OCCL and DOFAW staff will be assessing the site primarily for the following criteria or indices:

1. Implementation of mitigation methodology detailed in Koa Timbers forest management plan, namely mechanical weed clearing, herbicide application, and soil scarification. Quantification by Koa Timber of the effects and efficiency of these treatments in stimulating koa regeneration is highly recommended.

2. New koa regeneration resulting from site preparation efforts, seedling planting, or a combination. This koa regeneration will represent a new age cohort of seedlings, and should equal or exceed the 200 seedling per treated acre as stipulated in Koa Timbers third draft mitigation plan. Reasonable spatial distribution of new koa seedlings for long-term growth will be viewed as an essential factor. Koa seedlings that presently exist on the site along road grades will not be included in this tally.

Addendum A

Proposed Project Evaluation

Table 1 characterizes the site in terms of type of roads and their lengths as determined with GPS tracking and GIS analysis. Road widths were averages across the different roads examined. Based on these measurements and scaling to an area basis gives approximately a 4.25 acre or 185,130 ft2 treatment area and the basis for further calculations.

Budget restricted to approximately **$20,000** and within this amount **43% ($9000)** is allocated towards labor for actual removal effort (remaining funds include management, equipment and supply costs). Based on the labor allocation and an hourly labor rate of $18/hr there are 500 paid labor hours available. With a total area of 185,130 ft2 to clear in 500 hrs this equates to a hourly rate of 370 ft2 or a square dimensional area of 19ft x 19ft. However when travel time to the remote work site is factored in at 1.5 hours per day the actual time available for vegetation clearing is 425 hrs (10 hrs - 1.5 hrs travel = 8.5hr/10hr = 0.85x500). This increases the necessary **hourly clearance rate to 436 ft2/hr** or a square dimensional area of 21ft x 21ft hour.

The final area cleared is thus directly dependent on the hourly progress rate and will decrease in direct proportion. As an example if the clearance rate (square dimensional area of approximately 15ft x 15ft per hour) decreases 50% then the final area cleared will only be 93,304 ft2 (2.1 acres).

The primary consideration in the available labor resources will thus be that the removal is to be done by hand and the difficulty of the labor intensive effort involved. The rate of removal (linear road length and\or area per day basis) is a large unknown. The ground cover is dominated by a thick layer of several herbaceous species reaching nearly three feet in height that surrounds all of the regenerating koa seedlings. Removal of this dense material will be done with weed wackers but will take time for diligence near growing seedlings. Dense stands of *Psidium cattleianum* present on the edges of trails will obviously require more effort than the thin or intermittent clumps within the cleared area of the trials.. The same considerations would apply to other exotic shrub species to be removed. In either case the cut material is to be collected and stacked into piles to maximize soil surface exposure to enhance conditions for germination of new *Acacia koa* seedlings. In many cases additional bucking (cut to length) will be required to allowing for piling and thus an additional labor time commitment is involved. **Additional time allocated to establishing research plots will also directly decrease the amount of time available for site maintenance.**

In the conduct of this project another consideration should be that the main road accessing the area is also a water drainage collection zone and used as a travel zone to access hunting trials that originate off the road. Removal of vegetation in the central portion of the road will likely increase erosion and sediment runoff. It is recommended that a central 4m wide portion of the main road not be cleared of vegetation to inhibit soil movement. Where necessary (steep slopes and existing gullies) and possible harvested *Psidium* poles should be bucked and laid

perpendicular to the trial to act as water bars, a practice recommended in DOFAW's Best Management Practices.

Table 1: Koa Timber Pauka'a mitigation lands road and skid trail dimensional measurements

ROAD Skid Trails	No.	LENGTH m	WIDTH m	AREA m2	AREA ha	AREA ac	AREA ft2
Primary	1	538	15	8070	0.8	2	87,120
Secondary	1	200	10	2000	0.2	0.5	21,780
Tertiary	7	100	10	7000	0.7	1.75	76,230
TOTAL		**838**		**17070**	**1.7**	**4.25**	**185130**
Hrs total	500	2		**34**	0.003	0.009	**370 ft2/hr**

Recommended Research Priorities - Secondary Objective

Based on management area to be treated and finite financial resources the following recommendations will provide for greater precision in planning future management and research activities in the area. The research priorities should be as follows:

A) Management logistical and treatment application cost and time analyses.

Invasive species removal in many conservation zones will be limited to hand clearing. The primary tools available will be mechanical (weed wackers and chainsaws) and chemical spray applicators. Labor time per unit area will be a function of the target species and population densities. This mitigation project will allow a good opportunity to quantitatively document the materials and labor time cost of mechanical vegetation removal and chemical control application. Data recorded will be daily individual man hours with the different techniques and corresponding area cleared or treated. Estimates of herbaceous biomass per unit area and woody stem numbers per unit area will be collected between representative areas. Auxiliary data collected will be prior day and current day environmental conditions.

B) Biological and ecological investigations.

Based on previous results that indicated the greatest germination and survival of koa seedlings in plots with mechanical and chemical control, all 10x10 m plots will be initially treated by mechanical removal and chemical control of exotic herbaceous and woody vegetation.

Primary treatments applied will be a post-emergence herbaceous chemical application (+/-) and ground scarification ((+/-) in a 2x2 (= 4 treatments) factorial design with three replications per treatment (=12 sites). Site selection along trails will be randomized within the final area cleared but will seek an adequate distribution across the area.

The post-emergent chemical treatment will test the effect of longevity of reduced herbaceous competition on koa seedling survival and growth. The scarification treatment will test the effect of site preparation on new koa seedling germination.

To maximize labor allocation two treatment plots will be established at the opposite parallel edges of the cleared skid trails. Each treatment plot will be paired with a companion control (unmanipulated) plots established within the adjacent undisturbed forest for a total of four plots established at each site and a total of forty eight 100m2 plots (=4800 m2).

Data analysis will use descriptive statistics and repeated measures analysis of variance for treatment and block (=site) effects on seedling germination and survival rates and height growth.

The presence of pigs in the area will undoubtedly effect results but will be considered equally probable of occurring in all plots and thus treated as an uncontrolled variable. If it can be asserted that pig damage was more prevalent or non-existent within a site or plots within a site than the treatment and block effects can be adjusted accordingly with the new variable.

In addition to the vegetation control experimental plots belt transects in the adjacent undisturbed forest should be established. Three 100m x 10m transects could be established surrounding the impacted area to characterize the forest structure in terms of stem density and canopy coverage by species. This will allow for quantitatively determining the existent forest canopy structure and the impact of the vegetation control mitigation efforts on future forest canopy structure.

Table 2: Results of Previous Single Tree Removal and Acacia koa Regeneration and Exotic Species Control Treatments. Experimental design and data collection , 6/01 - 5/03 -Wade Lee.

NewTRT	REMOV	HERB	PREP	Plot	Rep	Seedling Numbers 0 D0	14 D1	28 D2	42 D3	694 D4	Days D4/D0
1	+	+	+	1	1	8	11	3	10	14	Survival
				3	2	48	42	21	93	18	
				8	3	17	60	41	67	50	
					Mean	24				27	**1.1**
2	+	+	o	4	1	19	19	5	12	22	
				5	2	2	2	1	0	0	
				13	3	5	5	1	1	0	
					Mean	9				7	**0.8**
3	+	o	+	14	1	31	34	8	26	14	
				2	2	11	13	5	11	1	
				10	3	9	24	11	26	18	
					Mean	17				11	**0.6**
4	+	o	o	6	1	17	14	13	18	10	
				7	2	36	47	28	40	20	
				15	3	33	43	43	48	10	
					Mean	29				13	**0.5**
5	o	+	o	9	1	105	104	98	103	88	
				11	2	56	27	8	20	5	
				17	3	2	2	1	0	7	
					Mean	54				33	**0.6**
6	o	o	o	16	1	168	168	90	121	82	
				12	2	1	3	3	3	3	
				18	3	76	76	52	86	10	
					Mean	82				32	**0.4**

Response to DOFAW comments on the mitigation plan for the Pauka'a lands managed by Koa Timber.

R.S. Senock, PhD - 2/27/2004

Primary DOFAW suggestions were:

1) Field evaluation of all primary reforestation methods.
2) Large-scale quantification of site conditions including koa seedling and weed density figures.
3) Discussion on field scale treatment applications and factorial experimental plot design including treatment evaluations and seedling plantings.

Principal objective of mitigation plan is removal of invasive species including but not limited to *Psidium cattleianum* (Strawberry Guava) from all roads and skid trails in the conservation district (4.8 ac, DLNR 1/12/04 letter) and other disturbed areas (8 ac) in the conservation district (total = 13 ac, MC per comm. 2/24/04).

Summary Findings

Much of the disturbed area within the skid trails has considerable koa seedling regeneration already occurring . Their continued survival and growth however, is currently threatened by a continuous and dense multi-species herbaceous layer reaching nearly three feet in height. Future threats to adequate levels of survival and growth will be *Psidium cattleianum* seedling and sprouts that already exists and will continue to develop into increasingly dense thickets, similar to that which already characterize much of the area.

Given the current status of the vegetation and the probable development of the plant communities over time, the primary objective of the labor efforts in the mitigation should be primarily directed at vegetation clearing to ensure regeneration of *Acacia koa* within the conservation zone. As a secondary objective, research and data collection activities should emphasize field evaluation of the vegetation removal activities with both labor cost time analyses and experimental plot establishment for future monitoring of results. An adequate field experimental design to allow for valid statistical analysis based on the recommended treatments should use a minimum of 48 plots. This number of experimental plots will require a labor time commitment that will directly impact the final area cleared within the site.

The decision to establish research plots for future monitoring and treatment evaluation could either be made during the course of the operation or made up-front before the project starts. In either case the decrease in time allocated towards site maintenance should be acknowledged before hand. A realistic, pragmatic evaluation of the work outcomes is needed for the resources committed

In addition, however conducting the recommended research should also acknowledge the need for continuing, periodic measurements and the financial cost involved in the data collection and subsequent analysis and interpretation. Financial resources will undoubtedly have to be committed and allocated for the initial investment to provide an adequate rate of return for investing in scientific and management information collection. Loss of the initial resource investment and the opportunity for future analysis will occur if no future resources are committed.

Addendum B

Hawai'i's most invasive horticultural plants

This is a list of the worst invasive horticultural plants in Hawai'i as put forth by the Hawai'i State Alien Species Coordinator (Department of Land & Natural Resources [DLNR], Division of Forestry & Wildlife [DOFAW]).

Species (Family)	Common Name	Other names
Acacia confusa (Fabaceae)	Formosan koa	
Angiopteris evecta (Marattiaceae)	Mule's foot fern	giant fern
Antigonon leptopus (Polygonaceae)	Mexican creeper	mountain rose, coral bells, confederate vine, chain-of-love, hearts-on-a-chain
Ardisia crenata (Myrsinaceae)	Hilo holly	hens eyes, *Ardisia crispa*, *Ardisia crenulata*
Ardisia elliptica (Myrsinaceae)	Shoebutton ardisia	*Ardisia humilis*, *Ardisia solanacea*, *Ardisia squamulosa*
Artabotrys hexapetalus (Annonaceae)	climbing ylang-ylang	lanalana
Arthrostema ciliatum (Melastomataceae)	arthrostemma	*Arthrostemma latifolia*, *Arthrostemma fragile*
Asparagus densiflorus (Liliaceae)	asparagus fern	sprengeri fern, foxtail asparagus, Asparagus sprengeri Regel
Asparagus setaceus (Liliaceae)	climbing asparagus fern	plumosa, Asparagus plumosus Baker, Protasparagus plumosus
Azolla (all species) (Azollaceae)	mosquito fern	ferny azolla
Buddleja davidii (Buddlejaceae)	orange-eyed butterfly bush	summer lilac, buddleia
Buddleja madagascariensis (Buddlejaceae)	butterfly bush	smoke bush, buddleia
Carmona retusa (Boraginaceae)	Fukien tea	Philippine tea, *Carmona microphylla*, *Ehretia buxifolia*, *Ehretia microphylla*
Casuarina (all species) (Casuarinaceae)	ironwood	Australian pine, she-oak, beefwood, toa
Cestrum diurnum (Solanaceae)	day cestrum	makahala, Chinese inkberry
Cestrum nocturnum (Solanaceae)	night cestrum	night-blooming jasmine, 'Ala-aumoe, kupaoa, onaona-iapana
Chrysophyllum oliviforme (Sapotaceae)	satin leaf	caimitillo; *Chrysophyllum monopyrenum*
Cinnamomum burmannii (Lauraceae)	Padang cassia	cinnamon tree
Cissus nodosa (Vitaceae)	grape ivy	
Citharexylum caudatum (Verbenaceae)	fiddlewood	juniper berry
Citharexylum spinosum (Verbenaceae)	fiddlewood	*Citharexylum quadrangulare*
Clerodendrum buchanani (Verbenaceae)	pagoda flower	lau'awa, *Clerodendrum fallax*, *C. speciosissimum*
Clerodendrum chinense (Verbenaceae)	glory bower	*Clerodendrum philippinum*, *Clerodendrum fragrans*
Clerodendrum macrostegium (Verbenaceae)	(no common name)	
Clusia rosea (Clusiaceae)	autograph tree	copey, Scotch attorney
Coccinia grandis (Cucurbitaceae)	ivy gourd	scarlet-fruited gourd
Conocarpus erectus (Combretaceae)	buttonwood	sea mulberry, button mangrove
Cortaderia jubata and Cortaderia selloana (Poaceae)	pampas grass	
Cotoneaster pannosus (Rosaceae)	cotoneaster	
Cryptostegia (all species) (Asclepidaceae)	rubber vine, India rubber vine	(includes *Cryptostegia grandiflora* and *Cryptostegia madagascariensis*)
Cupaniopsis anacardioides (Sapindaceae)	carrotwood	
Delairea odorata (Asteraceae)	German ivy	*Senecio mikanioides*, Italian ivy, African ivy, Cape ivy, climbing groundsel
Dillenia suffruticosa (Dilleniaceae)	shrubby simpoh	
Duranta erecta (Verbenaceae)	golden dewdrop	duranta, pigeon berry, *Duranta repens*
Eichhornia crassipes (Pontederiaceae)	water hyacinth	
Elaeagnus umbellata (Elaeagnaceae)	oleaster	autumn olive
Erigeron karvinskianus (Asteraceae)	daisy fleabane	Mexican daisy
Eriobotrya japonica (Rosaceae)	loquat	Japanese medlar
Ficus cf. platypoda (Moraceae)	Port Jackson fig (local name)	(this plant is commonly referred to in Hawai'i incorrectly as *Ficus rubiginosa*)
Ficus microcarpa (Moraceae)	Chinese banyan	Malayan banyan, *Ficus retusa*, *Ficus nitida*
Fuchsia boliviana (Onagraceae)	fuchsia	lady's eardrops
Fuchsia magellanica (Onagraceae)	hardy fuchsia	lady's eardrops, earring flower, kulapepeiao
Fuchsia paniculata (Onagraceae)	fuchsia	Lady's eardrops
Furcraea foetida (Agavaceae)	Mauritius hemp	maguey, *Furcraea gigantea*

Grevillea robusta (Proteaceae)	silk oak	she oak, he oak, silver oak, kahili flower, spider flower, ha'iku-ke'oke'o
Hedychium coronarium (Zingiberaceae)	white ginger	butterfly lily, ginger lily, garland flower, 'awapuhi-ke'oke'o
Hedychium flavescens (Zingiberaceae)	yellow ginger	cream ginger, 'awapuhi-melemele
Hedychium gardnerianum (Zingiberaceae)	kahili ginger	
Heterocentron subtriplinervium (Melastomataceae)	pearl flower	
Hiptage benghalensis (Malpighiaceae)	hiptage	
Hydrilla verticillata (Hydrocharitaceae)	hydrilla	water thyme, Florida elodea
Jasminum fluminense (Oleaceae)	jasmine	*Jasminum azoricum*
Kalanchoe delagoensis (Crassulaceae)	chandelier plant	*Kalanchoë tubiflora, Bryophyllum tubiflorum, Kalanchoe verticillata*
Kalanchoe pinnata (Crassulaceae)	air plant	life plant, 'oliwa ku kahakai, *Bryophyllum pinnatum, Cotyledon pinnata*
Lantana camara (Verbenaceae)	lantana	lakana, mikinolia-hihiu, sage
Lemna (all species) (Lemnaceae)	duckweed	
Leptospermum scoparium (Myrtaceae)	New Zealand tea	manuka
Ligustrum lucidum (Oleaceae)	tree privet	broadleaf privet
Ligustrum sinense (Oleaceae)	Chinese privet	hedge privet, small-leaved privet
Lonicera japonica (Caprifoliaceae)	Japanese honeysuckle	honekakala
Medinilla cumingii (Melastomataceae)	medinilla	
Medinilla venosa (Melastomataceae)	medinilla	
Melaleuca quinquenervia (Myrtaceae)	paperbark	cajeput tree
Melastoma candidum (Melastomataceae)	Indian rhododendron	*Melastoma malabathricum*, Malabar melastome
Melastoma sanguineum (Melastomataceae)	fox-tongued melastoma	
Melia azedarach (Meliaceae)	Chinaberry	pride-of-India, margosa tree
Miconia calvescens (Melastomataceae)	miconia	velvet tree, purple plague
Montanoa hibiscifolia (Asteraceae)	tree daisy	
Najas (all species) (Najadaceae)	naiad	pondweed
Nymphaea (all species) (Nymphaceae)	water lily	
Ochna thomasiana (Ochnaceae)	Mickey Mouse plant	ochna, *Ochna kirkii*
Olea europaea (Oleaceae)	olive	'oliwa
Passiflora laurifolia (Passifloraceae)	yellow granadilla	yellow water lemon, bell apple
Pennisetum setaceum (Poaceae)	fountain grass	*Pennisetum ruppelii*
Philadelphus karwinskyanus (Hydrangeaceae)	mock orange	philadelphus, syringa
Photinia davidiana (Rosaceae)	photinia	*Stranvaesia davidiana, Cotoneaster frigidus*
Pimenta dioica (Myrtaceae)	allspice	*Pimenta officinalis*
Pimenta racemosa (Myrtaceae)	bay-rum	malagueta, bay tree, *Pimenta acris*
Pinus patula (Pinaceae)	Mexican weeping pine	jelecote pine, patula pine, pino triste
Pistia stratiotes (Araceae)	water lettuce	
Pittosporum pentandrum (Pittosporaceae)	mamalis	
Pittosporum undulatum (Pittosporaceae)	Victorian box	Victorian laurel, orange pittosporum
Pittosporum viridiflorum (Pittosporaceae)	Cape pittosporum	
Platycerium bifurcatum (Polypodiaceae)	elkhorn fern	common staghorn fern
Psidium cattleianum (Myrtaceae)	strawberry guava	waiawi-'ula'ula
Pyracantha angustifolia (Rosaceae)	firethorn	
Rhodomyrtus tomentosa (Myrtaceae)	rose myrtle	downy myrtle
Rubus (all species) (Rosaceae)	blackberry, raspberry	thimbleberry, brambles, 'ohelo 'ele 'ele
Ruellia devosiana (Acanthaceae)	Ruellia	
Salvinia (all species) (Salviniaceae)	floating fern	
Schefflera actinophylla (Araliaceae)	octopus tree	*Brassaia actinophylla*, umbrella tree
Schinus molle (Anacardiaceae)	pepper tree	California pepper tree
Schinus terebinthifolius (Anacardiaceae)	Christmas berry	Brazilian pepper, wilelaiki, nani-o-hilo
Solandra maxima (Solanaceae)	cup-of-gold	golden cup, chalice vine
Spathodea campanulata (Bignoniaceae)	African tulip tree	fountain tree, fire bell
Sphaeropteris cooperi (Cyatheaceae)	Australian treefern	*Cyathea cooperi*
Sphagneticola trilobata (Asteraceae)	wedelia	Wedelia trilobata
Stapelia gigantea (Asclepiadaceae)	carrion flower	starfish flower, Zulu-giant, giant toad plant
Tamarix (all species) (Tamaricaceae)	?	
Terminalia catappa (Combretaceae)	tropical almond	Indian almond, false kamani, kamani-haole
Tetrazygia bicolor (Melastomataceae)	(no common name)	
Thunbergia grandiflora (Acanthaceae)	Bengal trumpet	blue trumpet vine, large-flowered thunbergia
Thunbergia laurifolia (Acanthaceae)	laurel-leaved thunbergia	
Tibouchina herbacea (Melastomataceae)	cane tibouchina	glorybush
Tibouchina urvilleana (Melastomataceae)	glorybush	princess flower, lasiandra

Addendum C

Triclopyr

This information on Triclopyr was prepared for the U.S. Department of Agriculture, Forest Service by Information Ventures, Inc.

This fact sheet is one of a series issued by the Forest Service, the Bureau of Land Management, and the Bonneville Power Administration for their workers and the general public. It provides information on forest and land management uses, environmental and human health effects, and safety precautions for the herbicide triclopyr and its formulations. Unless otherwise stated, the toxicity data presented in this fact sheet refer to the active ingredient, triclopyr. When included, data on formulated products will be specifically identified. A list of definitions is included in Section VIII of the fact sheet.

I. Basic Information

Common name: Triclopyr

Chemical name: [(3,5,6-trichloro-2-pyridinyl)oxy]acetic acid

Common Product names: Garlon®, Grazon®

Pesticide classification: herbicide

Registered Use Status: "General Use"

Formulations: Commercial triclopyr products generally contain one or more inert ingredients. An inert ingredient is anything added to the product other than an active ingredient. Because of concern for human health and the environment, the U.S. Environmental Protection Agency (EPA) announced its policy on toxic inert ingredients in the Federal Register on April 22, 1987 (52 FR 13305). The intent of this policy is the regulation of inert ingredients. EPA's strategy for the implementation of this policy included the development of four lists of inerts based on toxicological concerns. Inerts of toxicological concern were placed on List 1. Potentially toxic inerts/high priority for testing were placed on List 2. Inerts of unknown toxicity were placed on List 3 and inerts of minimal concern were placed on List 4.

For pesticides containing List 1 inerts, the EPA has given the pesticide registrant the opportunity to reformulate the product to remove the List 1 inerts. If the registrant chooses not to reformulate the product, then the List 1 inerts must be identified on the product label. For List 2 inerts, the EPA is monitoring ongoing testing and gathering existing information on the potential adverse effects of these chemicals to determine if further regulatory action is required. The EPA has no particular regulatory plans for List 3 and List 4 inerts. The Forest Service will incorporate new data on inerts into updated fact sheets as it becomes available.

The contents of two triclopyr formulations are listed below.

Garlon® 3A: triclopyr (44.4%), and inert ingredients (55.6%) including water, emulsifiers, surfactants, and ethanol (1%)

Garlon® 4: triclopyr (61.6%), and inert ingredients (38.4%) including kerosene

Residue assay methods: Gas/liquid chromatography methods are available for residue assay.

II. Herbicide Uses

Registered forestry, rangeland, right-of-way uses: control of woody plants and broadleaf weeds on rights-of-way, non-crop areas, non-irrigation ditch banks, forests, wildlife openings, rangeland and permanent grass pastures

Operational details:

Target Plants: Triclopyr is used to control woody plants and broadleaf weeds.

Mode of action: Triclopyr acts by disturbing plant growth. It is absorbed by green bark, leaves and roots and moves throughout the plant. Triclopyr accumulates in the meristem (growth region) of the plant.

Method of application: ground or aerial foliage spray, basal bark and stem treatment, cut surface treatment, tree injection

Use rates: Use at 0.25 to 9 pounds acid equivalent per acre

Special Precautions:

Always read all of the information on the product label before using any pesticide. Read the label for application restrictions.

Timing Of Application: For foliar treatment, apply triclopyr during active plant growth. Basal bark and cut surface treatments can be done at any time of year. Dormant stem application can only be done when trees and brush are dormant.

Drift Control: Apply triclopyr only when there is little or no hazard of spray drift. Do not allow spray to come in contact with broadleaf crops. Spray only when wind speed is low. Avoid fine spray, which may drift.

III. Environmental Effects/Fate

Soil:

Residual Soil Activity: Triclopyr is active in the soil, and is absorbed by plant roots.

Adsorption: Triclopyr is adsorbed by clay particles and organic matter particles in soil.

Persistence and Agents of Degradation: Microorganisms degrade triclopyr rapidly; the average half-life in soil is 46 days. Triclopyr degrades more rapidly under warm, moist conditions.

Metabolites/Degradation Products and Potential Environmental Effects: 3,5,6-Trichloro-2-pyridinol is the major initial product of degradation. It has a half-life of 30 to 90 days, and degrades to carbon dioxide and organic matter.

Water:

Solubility: moderate to low

Potential For Leaching Into Ground-Water: The potential for leaching depends on the soil type, acidity and rainfall conditions. Triclopyr should not be a leaching problem under normal conditions since it binds to clay and organic matter in soil. Triclopyr may leach from light soils if rainfall is very heavy.

Surface Waters: Sunlight rapidly breaks down triclopyr in water. The half-life in water is less than 24 hours.

Do not allow triclopyr to pollute irrigation ditches or water used for irrigation or domestic use.

Air:

Volatilization: very low

Potential For By-Products From Burning of Treated Vegetation: Information is not currently available.

IV. Ecological Effects

Non-Target Toxicity:

Soil Microorganisms: Triclopyr is slightly toxic to practically non-toxic to soil microorganisms.

Plants: Triclopyr is toxic to many plants. Even very small amounts of spray may injure some plants.

Aquatic Animals: Triclopyr is low in toxicity to fish. The ester form of triclopyr, found in Garlon 4, is more toxic, but under normal conditions, it rapidly breaks down in water to a less toxic form. Triclopyr does not accumulate in fish. Triclopyr is slightly toxic to practically non-toxic to invertebrates. Triclopyr and its formulations have not been tested for chronic effects in aquatic animals. Acute toxic level:

Table 13 Lethal concentrations of Triclopyr for several aquatic species.

Species	LC50
trout	117 ppm
bluegill	148 ppm
daphnia	1,140 ppm

Terrestrial Animals: Triclopyr is slightly toxic to mammals. In mammals, most triclopyr is excreted, unchanged, in the urine. Triclopyr and its formulations have very low toxicity to birds. Triclopyr is non-toxic to bees. Triclopyr and its formulations have not been tested for chronic effects in terrestrial animals. Acute toxic level:

Table 14 Lethal concentrations of Triclopyr for several non-aquatic species.

Species	LD50
mammals	310-713 mg/kg
ducks	1,698 mg/kg
bee	<60 micrograms/bee

In eight day dietary studies in birds, the LC50 ranged from 2,935 to greater than 5,000 ppm.

Threatened and Endangered Species: Triclopyr may be a hazard to endangered plant species if it is used in areas where they live. The hazard to endangered animal species has not been determined.

V. Toxicology Data

Acute toxicity:

Acute oral toxicity: In tests in rats, the acute oral LD50 was 630 to 729 mg/kg.

Acute dermal toxicity: The acute dermal (skin) LD50 was greater than 2,000 mg/kg in rabbits.

Primary irritation score: In laboratory tests, triclopyr was a slight to moderate irritant.

Primary eye irritation: In laboratory tests in rabbits, triclopyr was a slight eye irritant.

Acute Inhalation: In a laboratory test in rats, exposure to 5.34 ppm for 1 hour caused no adverse effects.

Chronic toxicity:

Carcinogenicity: Laboratory tests in mice and rats fed up to 30 mg/kg per day for 2 years did not show any evidence of carcinogenicity.

Developmental: Laboratory studies with triclopyr in pregnant rats (at dose levels up to 200 mg/kg per day) and rabbits (at dose levels up to 100 mg/kg per day) indicated no evidence of teratology (birth defects). In pregnant rats at the 200 mg/kg per day dose level, there were signs of mild toxicity to the fetus.

Reproduction: A three-generation reproduction study in rats did not show any adverse effects on fertility or reproduction at doses up to 30 mg/kg per day.

Mutagenicity: Triclopyr was negative in several laboratory tests for mutagenicity (the ability to cause genetic damage), but was weakly positive in a test in rats.

The data reported above are results of animal studies which have been evaluated by the Forest Service. These data are used to make inferences relative to human health.

HAZARD: Based on the results of animal studies, triclopyr does not cause birth defects or cancer, and has little or no effect on fertility, or reproduction. Triclopyr is mildly fetotoxic. There is not enough information available to determine whether triclopyr causes genetic damage. There have been no reported cases of long term health effects in humans due to triclopyr exposure.

VI. Human Health Effects

Acute toxicity (poisoning):

Reported effects: No reported effects.

Chronic toxicity:

Reported effects: No reported effects.

Potential for adverse health effects from contacting or consuming treated vegetation, water or animals: The exposure levels a person could receive from these sources, as a result of routine operations, are below levels shown to cause harmful effects in laboratory studies.

Potential for adverse health effects from inert ingredients contained in the formulated product: Inert ingredients found in triclopyr products may include water, petroleum solvents, kerosene, surfactants,

emulsifiers, and methanol. Water is not toxic. Methanol, kerosene and petroleum solvents may be a toxic hazard if the pesticide is swallowed. Surfactants and emulsifiers are generally low in toxicity.

Health effects of exposure to formulated products: The formulated products are generally less toxic than triclopyr. Garlon® 3A is a skin irritant and a severe eye irritant.

Health effects associated with contaminants: No known major contaminants

Health effects associated with other formulations: Some formulations of triclopyr also contain the herbicides 2,4-D or picloram. **The information in this fact sheet does not apply to 2,4-D or picloram.** Please consult other sources for information on these herbicides.

Health risk management procedures: The Forest Service has evaluated health effects data in the development of both pesticide background statement documents and environmental impact statements for pesticide use on forestlands. These health effects evaluations have taken into consideration the potential for both worker and public exposure from Forest Service operations. This information has been used in assessing health risks and consequently in formulating protective measures to reduce risk to forest workers and to the public. Section VII of this fact sheet, Safety Precautions, provides guidance for the safe handling and use of triclopyr.

VII. Safety precautions:

Signal word and definition:

Grazon® ET - **CAUTION** - HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN.

Garlon® 4 - **CAUTION** - HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN.

Garlon® 3A - **WARNING** - CAUSES EYE DAMAGE AND SKIN IRRITATION; HARMFUL IF SWALLOWED.

Protective Precautions for Workers: Avoid contact with eyes, skin, or clothing. Avoid contamination of food. Wash thoroughly after handling. For Garlon 3A, wear goggles or face shield and rubber gloves when handling. For Garlon 4 and Grazon ET, avoid breathing mists or vapors. Remove and wash contaminated clothing before reuse.

Medical Treatment Procedures (Antidotes): There is no specific antidote known; treat the symptoms. If swallowed, get medical attention. For exposure to the skin, flush with plenty of water. Get medical attention if irritation persists. For eye exposure to Garlon 3A, flush with plenty of water for at least 15 minutes. Get medical attention. **In case of emergency, call your local poison control center for advice.**

Handling, Storage, And Disposal: Avoid contact with eyes, skin or clothing. Do not ship or store with food, animal feeds, drugs or clothing. Triclopyr formulations are combustible. Do not use or store near heat or open flame. Do not cut or weld container. Triclopyr is stable for at least 2 years under normal storage conditions. Do not contaminate water by disposal. Dispose of this pesticide according to Federal, state or local procedures.

Emergency (Spill) Hazards And Procedures: Dike large spills. Keep the spill out of streams and water supplies. Absorb small spills with sand or other inert material. Bury material from small spills of Garlon 4 in an approved landfill. Bury material from small spills of Garlon 3A in non-crop area away from water supplies. For large spills, contact the manufacturer for instructions. Observe all local, State and Federal rules for disposal. **In case of a large spill, call CHEMTREC at 1-800-424-9300 for advice.**

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

REF:OCCL:DH

ENF: HA-04-11

JUN - 4 2004

Mr. Kyle Dong
C/o Karen Piltz
Chun, Kerr, Dodd, Beaman & Wong
745 Fort Street, 9th Floor
Honolulu, Hawaii 96813

SUBJECT: Approval Land Restoration Plan

The attached land restoration plan has been approved. Please submit a letter indicating the start date of the land restoration plan.

Please adhere to the following terms and conditions:

1) The applicant shall comply with all applicable statutes, ordinances, rules, regulations, and conditions of the Federal, State and County governments;

2) The applicant, its successors and assigns, shall indemnify and hold the State of Hawaii harmless from and against any loss, liability, claim or demand for property damage, personal injury or death arising out of any act or omission of the applicant, its successors, assigns, officers, employees, contractors and agents under this permit or relating to or connected with the granting of this permit;

4) The applicant shall comply with all applicable Department of Health administrative rules. Particular attention should be paid to Hawaii Administrative Rules (HAR) Section 11-60.1-33, "Fugitive Dust" and to Chapter 11-46, "Community Noise Control; if applicable"

5) The applicant shall plan to minimize the amount of dust generating materials and activities. Material transfer points and on-site vehicular traffic routes shall be centralized. Dusty equipment shall be located in areas of least impact. Dust control measures shall be provided during weekends, after hours and prior to daily start-up of project activities. Dust

EXHIBIT 3

from debris being hauled away from the project site shall be controlled. Landscaping and dust control of cleared areas will be initiated promptly;

6) The applicant understands and agrees that this approval does not convey any vested rights or exclusive privilege;

7) Where any interference, nuisance, or harm may be caused, or hazard established by the use, the applicant shall be required to take the measures to minimize or eliminate the interference, nuisance, harm, or hazard; and

8) During implementation of the land restoration plan, appropriate mitigation measures shall be implemented to minimize impacts to off-site roadways, utilities, and public facilities;

Please acknowledge receipt of this approval, with the above noted conditions, in the space provided below. Please sign two copies. Retain one and return one copy with the approval within thirty (30) days.

Should you have any questions on any of these matters, please feel free to contact Dawn Hegger of at 587-0380.

Aloha,

PETER T. YOUNG, Chairman
Board of Land and Natural Resources

Receipt acknowledged:

Applicant's Signature

6/11/04
Date

cc: Chairman
Hawaii Board Member
Hawaii Land Agent
DOCARE/DOFAW
County of Hawaii Planning Department

Koa Timber Inc. Restoration Plan

Status Report

October 19, 2004

EXHIBIT 4

Brief Summary

Koa Timber, Inc., is pleased to submit this first report on the status of the restoration plan. Dr. Randy Senock and Wade Lee oversaw the restoration work on the conservation district site in Paukaa. A crew of students worked with Dr. Senock and Mr. Lee clearing the site of invasive species, consisting mainly of strawberry guava. Based on the work completed so far, continual, periodic follow-up will be required to maintain the land that has been cleared. Also, additional work on the experimental plots will continue for further observations and analysis.

It should be noted that the characteristics of the mitigation site within the conservation zone are not representative of the typical sites within the remainder of the conservation zoned property. Caution should be exercised when extrapolating the project results and its application to future planned efforts at forest management and restoration in the wider proposed project area

Work on the Koa Timber Paukaa Mitigation project began July 13, 2004 and was temporarily suspended on August 9, 2004. During this period work week hours ranged from 30 to 36 hours per week and totaled 470 man hours for the period. Travel time to the remote area from the access highway averaged 1.5 hrs\day. The actual daily work period ranged from 10 to 7.5 hrs\day including one hour for lunch for a final actual work period of 435 man hours.

Work at the site was again conducted during the week of September 20, 2004. Emphasis during this time period focused on the treatment application to the experimental plots, recording baseline conditions in the plots, counting of koa saplings and seedlings present in the cleared areas, and collection of ancillary data in adjoining non-disturbed areas.

Current final total cleared and treated area is conservatively estimated at three (3) acres. This represents 50% of the MOA stated goal of six acres or 70% of the actual measured site disturbed area (4.5 acres) in the conservation area. A total of 255 man hours was dedicated to clearing the main and secondary trails or 59% of the total available work time.

The average rate of area cleared was 300 ft2/hour or 69% of the original estimated rate to treat 4.5 acres of site disturbance. The lower average rate was a function of the different methods employed and the biomass and\or stem densities in different areas of the site (i.e. grass vs. woody plants). Clearing of herbaceous material by weed-wacking ranged from 600 to 1900 ft2\hr. The clearing of strawberry guava by hand machete ranged from 200 to 800 ft2\hr in stem densities of 2 to 4 stems \ft2.

There were thirty (30) experimental plots established or 63% of the estimated number of plots (48) for adequate experimental field tests of targeted treatments. A total of 180 man hours was dedicated to establishing the experimental plots or 41% of the total work time. (See Exhibit A).

Given the uncertainties regarding the design and implementation of the mitigation plan the actual work accomplished should be considered within acceptable limits of the agreed upon MOA target goals.

The initial restoration plan estimated that approximately $21,014.00 would be spent for the implementation of mitigation efforts. To date, through various innovative work methods, a total of $19,100.00 has been spent on the restoration of the area. An accounting of the funds has been attached for review. (See Exhibit B).

Initial Work Accomplished & Results

Area Cleared

Approximately 2500 linear feet (½ mile) of main and secondary skid trails were initially cleared of herbaceous grass material by weed-whacking. Trail widths ranged from 25 to 55 feet for a cleared area of nearly 2 acres. The cleared areas initially received herbicide application (Roundup) of 2oz per gallon of water (~2% solution rate). A second application of herbicide was applied to the entire area on September 4 2004.

Experimental Plots Established

A total of 30 experimental treatment plots (35 x 35 feet) were established in a total cleared area of slightly less than one acre. The majority of the plots were established in areas adjacent to live standing trees that were observed to have produced seeds. A large majority of the plots were in areas cleared of high stem densities of strawberry guava. Each plot was marked with a GPS waypoint.

Equipment Time Trials

During the course of the work six time trials (typically 30 minutes in duration) with various hand equipment were conducted to establish average rates of ground clearing. The clearing of herbaceous material by weed-whacking ranged from 600 to 1900 ft2\hr. The clearing of strawberry guava by hand machete ranged from 200 to 800 ft2\hr in stem densities of 2 to 4 stems\ft2. The clearing of strawberry guava by using a cutting blade mounted on the weed-whackers ranged from 350 to 600 ft2\hr with stem densities of 1 to 2 stems\ft2.

Work Analysis

A more detailed analysis of the labor time inputs, total final treated area, and final project cost puts the results of the project (to date) in perspective of both the MOA and the preceding reports during the working discussions leading up to the MOA.

Taken together, the treated areas and the area of the experimental plots produce a final actual total treated area estimated conservatively at three acres or 130,680 ft2. This represents 50% of the MOA stated goal of six acres or 70% of the actual measured site disturbed area (4.5 acres) in the Conservation area. A total of 255 man hours was dedicated to clearing the main and secondary trails or 59% of the total work time.

Using the 435 man hours of potential work time (versus the original estimate of 425 man hours) to accomplish the treated area is equivalent to an average of 300 ft2/hour or 69% of the original estimated rate (436 ft2/hour) to treat 4.5 acres of site disturbance.

The lower average rate was a function of the different methods employed and the biomass and\or stem densities in different areas of the site (i.e. grass vs. woody plants). The clearing of herbaceous material by weed-whacking ranged from 600 to 1900 ft2\hr. The clearing of strawberry guava by hand machete ranged from 200 to 800 ft2\hr in stem densities of 2 to 4 stems \ft2.

There were thirty (30) experimental plots established or 63% of the estimated number of plots (48) for adequate experimental field tests of targeted treatments. The majority of plots were established along the trail grade in areas of high strawberry guava stem densities that could only be cleared at an average rate of 200 ft2/hour. Each plot covered an area of 1225 ft2 (35x35 ft). More than 6 man hours were required to establish each experimental plot. A total of 180 man hours was dedicated to establishing the experimental plots or 41% of the total work time.

If an additional 180 man hours were devoted strictly to herbaceous vegetation clearing along the main trails (weed-whacking), using the measured rate of 600 ft2/hour, the result would be an additional 2.5 acres of cleared area, which when added to the two acres of main trails cleared would have resulted in 4.5 acres or equivalent to the original measured disturbed site area.

Given all of the uncertainties regarding the design and implementation of the mitigation plan and the desire to also establish an field experiment, the agreed upon stated work to be accomplished should be interpreted as including a wide degree of variation in the final results. The fact that a large percentage of both project goals were actually achieved should considered acceptable for this particular site.

As stated in the summary, characteristics of the mitigation site within the conservation zone are not representative of the typical sites within the remainder of the conservation zoned property. Caution should thus be exercised in extrapolating the current project results to any planned efforts at forest management and restoration in the wider proposed project area.

Results - Subsequent work accomplished

Work at the site was again conducted during the week of September 20, 2004. Emphasis during this time period focused on the application of herbicidal treatment to the experimental plots, recording baseline conditions in the plots, counting of koa saplings and seedlings present in the cleared areas, and collection of ancillary data in adjoining non-disturbed areas.

Work during this period was delayed because of restricted access from a new land tenant at the upper end installing a new gate and lock without notifying others (including the USGS) of the change. This new gate changed the site access time from 20 minutes to one hour. Full access to the site was finally regained on Sept 25, 2004.

Work accomplished during the September period included the spot spraying of herbaceous vegetation (small ed leaved grassed and Palm grass) with a mixture of roundup and Garlon 4.

Previous applications have produced a good "kill" and the follow-up applications have extended the treatment period. Continuing follow-up applications should maintain the area free of competing vegetation with existing Koa seedlings\saplings.

Established experimental plots (13 of 30) received continued treatment with Garlon. Small shoots of strawberry guava had re-sprouted since the initial clearing in July\August. The re-sprouts were cut with a 12-blade chainsaw cutting head attached to a weed-whacker. This technique worked well on the short standing re-sprouts allowing 100 m2 plots to be re-cleared in less than 20 minutes. Re-cut stumps were immediately treated with Garlon at a 4oz\gallon rate.

Existing koa seedlings were counted within both the established experimental plots and the cleared areas. A total of 597 seedlings and saplings were marked along the stem or bole within designated segments of the cleared area. This total number is equivalent to 222 re-generated koa trees per acre. The existing regeneration represents the surviving plants, as numerous dead seedlings were evident since the initial disturbance in 2000. This number will likely decrease as individual mortality continues. However, the clearing of the competing herbaceous and woody species should enhance survivability of remaining seedlings. Continued maintenance to reduce competition for water and nutrients will also be necessary to achieve long-term regeneration. The presence of a wide range of stem and\or bole diameters indicates that regeneration of Koa has been continual since the initial disturbance. The present land clearing or disturbance will likely result in continued regeneration of new Koa trees. Monitoring of the site over time should reveal the effectiveness of the approaches used.

Work accomplished during the September period also included the establishment of a plot transect located in an adjacent non-disturbed area. Individual plot size was 400 m2 or ½ hectre established every 400 ft along a 2000 ft transect or a total of 5 plots. Within each plot individual koa trees were measured for diameter at breast height, overall height, height to first fork and top end log diameter. Re-generation within the plots was tallied by the number of seedlings that were 0 to 1 inch and 1 to 3 inches DHB. It should be noted that no koa re-generation has been observed outside of the disturbed areas within the mitigation zone.

Results – Remaining Planned Work

Work at the site will again be conducted during the week of November 22, 2004. Emphasis during this time period will be the continued treatment of the remaining experimental plots. Where necessary, the remaining experimental plots will be treated with Garlon 4 on the re-sprouting strawberry guava and other non-native woody species. Plots will also be treated with Roundup to eliminate herbaceous non-native plant species. Once the primary treatments have been applied to all plots, individual plots will be

subject to applications of post-emergence herbicide and\or ground scarification according to the original experimental design to test different methods of promoting koa regeneration. Additional work will focus on recording baseline conditions in the plots, and continued collection of ancillary data in adjoining non-disturbed areas.

GIS based maps of the mitigation site, experimental plot and additional transect locations and data will be produced for future reference and included in subsequent reports.

Exhibit A.

GPS Plot Points

Datum	North America 1983	GRS 80		0 -1.60E-07	0
WP	UTM	AGZRNC	5Q	273774.8	2187114
WP	UTM	BOTSK1	5Q	273645	2187249
WP	UTM	GATE1K	5Q	280536.7	2187530
WP	UTM	GATE2K	5Q	276280.2	2187562
WP	UTM	GATE3	5Q	275582.5	2187222
WP	UTM	GATE4	5Q	274925.5	2187123
WP	UTM	MHUB	5Q	273563.4	2187421
WP	UTM	MILLST	5Q	274504.6	2187052
WP	UTM	NPLT01	5Q	273422.8	2187469
WP	UTM	NPLT02	5Q	273421.6	2187460
WP	UTM	NPLT03	5Q	273440.6	2187456
WP	UTM	NPLT04	5Q	273440.3	2187475
WP	UTM	NPLT05	5Q	273419.2	2187491
WP	UTM	NPLT06	5Q	273436.5	2187486
WP	UTM	NPLT07	5Q	273451.2	2187489
WP	UTM	NPLT09	5Q	273548.2	2187470
WP	UTM	NPLT10	5Q	273543.9	2187484
WP	UTM	NPLT11	5Q	273553.5	2187486
WP	UTM	NPLT12	5Q	273566.4	2187484
WP	UTM	NPLT13	5Q	273557.7	2187417
WP	UTM	NPLT14	5Q	273564.7	2187397
WP	UTM	NPLT15	5Q	273590	2187397
WP	UTM	NPLT16	5Q	273601.8	2187391
WP	UTM	NPLT17	5Q	273560.5	2187376
WP	UTM	NPLT18	5Q	273594.8	2187375
WP	UTM	NPLT19	5Q	273559.1	2187348
WP	UTM	NPLT21	5Q	273618.6	2187212
WP	UTM	NPLT22	5Q	273603.5	2187216
WP	UTM	NPLT23	5Q	273611	2187229
WP	UTM	NPLT24	5Q	273625.7	2187240
WP	UTM	NPLT25	5Q	273676.6	2187174
WP	UTM	NPLT26	5Q	273665.8	2187165
WP	UTM	NPLT27	5Q	273660.9	2187176
WP	UTM	NPLT28	5Q	273670.6	2187183
WP	UTM	RSPL15	5Q	273651.9	2187222
WP	UTM	RSPLT5	5Q	273698.8	2187153
WP	UTM	RSPLT9	5Q	273579.8	2187302
WP	UTM	SKRDTP	5Q	273114.2	2187613
WP	UTM	STARTP	5Q	274200.3	2187139
WP	UTM	STCONL	5Q	273705.2	2187169
WP	UTM	TOP	5Q	273476.3	2187519
WP	UTM	TOP1SD	5Q	273585.8	2187328

Exhibit B.

REFORESTATION
SUMMARY

MATERIAL

VENDOR	AMOUNT	
GARDEN EXCHANGE	730.03	CHECK 1
BEI HAWAII	135.65	CHECK 2
BEI HAWAII	608.85	CHECK 3
ON SOLID GROUND	2,000.00	CHECK 4
ATLAS INSURANCE	4,000.00	BANK CHECK
ON SOLID GROUND	2,000.00	CHECK 5
ALLIED MACHINERY CORP	551.04	PAID W. MASTERCARD
HILO ACE HARDWARE	18.08	PAID W. MASTERCARD
ALOHA/IMM HILO AIRPORT	22.68	PAID W. MASTERCARD
BAY FRONT TESORO	30.00	PAID W. MASTERCARD
HILO SURPLUS STORE	31.17	PAID W. MASTERCARD
HILO ACE HARDWARE	67.02	PAID W. MASTERCARD
WAL MART	69.02	PAID W. MASTERCARD
BAY FRONT TESORO	30.00	PAID W. MASTERCARD
HILO ACE HARDWARE	24.74	PAID W. MASTERCARD
HILO ACE HARDWARE	66.24	PAID W. MASTERCARD
BAY FRONT TESORO	40.00	PAID W. MASTERCARD
GARDEN EXCHANGE	40.00	PAID W. MASTERCARD
HILO ACE HARDWARE	62.34	PAID W. MASTERCARD
GARDEN EXCHANGE	90.83	PAID W. MASTERCARD
GARDEN EXCHANGE	194.01	PAID W. MASTERCARD
BAY FRONT TESORO	11.67	PAID W. MASTERCARD
BAY FRONT TESORO	40.00	PAID W. MASTERCARD
HILO ACE HARDWARE	49.75	PAID W. MASTERCARD
BAY FRONT TESORO	30.74	PAID W. MASTERCARD
SUB-TOTAL MATERIALS	10,943.86	

LABOR

PROSERVICE HAWAII	2,228.46	PAYROLL W/E 7/24, CHECK DATED 7/30
PROSERVICE HAWAII	2,469.80	PAYROLL W/E 7/31, CHECK DATED 8/6
PROSERVICE HAWAII	234.65	ADDITIONAL PAYROLL WE 7/31, CHECK DATED 8/6
PROSERVICE HAWAII	1,941.05	PAYROLL W/E 8/7, CHECK DATED 8/13
PROSERVICE HAWAII	747.95	PAYROLL W/E 8/14, CHECK DATED 8/20

PROSERVICE HAWAII	25.00	PAYROLL W/E 8/21, MINIMUM FEE
PROSERVICE HAWAII	169.59	PAYROLL W/E 8/28, CHECK DATED 9/3
PROSERVICE HAWAII	169.59	PAYROLL W/E 9/4, CHECK DATED 9/10
PROSERVICE HAWAII	25.00	PAYROLL W/E 9/11, MINIMUM FEE
PROSERVICE HAWAII	25.00	PAYROLL W/E 9/18, MINIMUM FEE
SUB-TOTAL LABOR	8,036.09	
TOTAL COST	**18,979.95**	
TOTAL DEPOSITED	**19,100.00**	
BALANCE REMAINING	**120.05**	

TWO-MONTH FIELD INSPECTION OF MITIGATION WORK CONDUCTED BY KOA TIMBER INC. ON CONSERVATION LANDS IN THE PAUKAA AREA OF THE ISLAND OF HAWAII

Conducted on portions of TMK parcel (3) 2-7-1-01 by:

The Department of Land and Natural Resources:
Division of Forestry and Wildlife

for

The Department of Land and Natural Resources:
Office of Conservation and Coastal Lands

Michael Constantinides
Forestry Program Manager
Division of Forestry and Wildlife
Honolulu, Hawaii
November 10, 2004

EXHIBIT 5

Executive summary

The following aspects of work accomplished by Koa Timber Inc. in relation to Board-mandated mitigation work were observed during a site visit on portions of TMK parcel (3) 2-7-1-01, Paukaa area, island of Hawaii:

1. Approximately 3.6 acres of land mechanically cleared of strawberry guava (*Psidium cattleianum*) saplings.
2. Herbicide treatment in this cleared area including Roundup sprayed on grasses and Garlon sprayed on guava stumps.
3. New koa natural regeneration comprised of a minimum of 180 seedlings.
4. Several experimental plots staked out for koa regeneration experimental purposes.

Each item is discussed in detail below.

1. Introduction

On January 9, 2004, the Board of Land and Natural Resources (BLNR) found Koa Timber Inc. in violation of Chapter 183C, Hawaii Revised Statues and Chapter 13-5, Hawaii Administrative Rules relating to unauthorized logging activities in TMK parcel (3) 2-7-1-01. As part of the resulting Board-mandated mitigation efforts, Koa Timber Inc. submitted a site restoration plan that BLNR approved on June 4, 2002. This document established that status reports from Koa Timber Inc. and site inspections and associated summary reports from the Division of Forestry and Wildlife (DOFAW) would be submitted or conducted at 2, 12, and 24 month milestones after primary mitigation work was conducted. Koa Timber Inc. submitted their two month status report to the Department dated October 19, 2004. This report details DOFAW's two month site inspection and comprises the Division's summary report on the status of mitigation work at the subject site.

2. Area of interest

The area of interest in parcel (3) 2-7-1-01 is located approximately 5.75 miles northwest of Hilo. The area is forested and lies near the makai extent of the lands of Paukaa, adjacent to the confluence of Honolii and Pohakupaa streams. The boundary between Agricultural and Conservation lands has a North-South orientation in this area, and passes approximately 200 feet makai of the stream confluence. Vegetation within the area of interest is primarily comprised of ohia (*Metrosideros polymorpha*) and koa (*Acacia koa*) overstory, and a mixed native-alien understory. Elevation within the area of interest ranges from approximately 1,800-2,000 feet. Average rainfall at this site is very high, probably exceeding 240 inches per year.

3. Field assessment methods

The intent of this field assessment was to observe and document the progress of Koa Timber Inc. in its implementation of the Board-approved mitigation plan. On November 1, 2004 a DOFAW crew conducted a walk-through of the logged area within the Conservation District where mitigation work had been conducted. Mr. Wade Lee representing Koa Timber Inc. accompanied the DOFAW crew. A Garmin GPS unit was used to collect a track file along the approximate centerline of treated areas, which were typically narrow corridors centered on the logging skid road system. This track file was later buffered during computer-assisted map analyses to depict a corridor width (i.e. treated area) of 35 feet – an average width estimated through field observations. A count of the number of koa seedlings that had clearly germinated since the Division's last site visit in September of 2003 was made within the cleared and treated mitigation area.

4. Field survey observations

Based on GPS data and computer-assisted map analyses, approximately 3.6 acres of lands impacted by logging have undergone recent treatment relating to the Koa Timber Inc. mitigation plan (Figure 1). Within the treated area strawberry guava was mechanically cleared. Mr. Lee explained that roundup was subsequently sprayed on grasses, and garlon was sprayed on guava stumps, and that guava stumps would be treated with garlon three more times at six month intervals.

A new cohort of young koa seedlings that had clearly germinated since September of 2003 was observed in the treated area, primarily on disturbed and exposed soils. This cohort was comprised of a minimum of 180 koa seedlings, or a minimum of 50 new seedlings per treated acre. Approximately 95% of the new koa seedlings were less than 4" in height, while the remaining 5% ranged in height from 5-12". During two previous site visits DOFAW staff noted the presence of young koa saplings along skid roads, the germination and growth of which was undoubtedly stimulated by soil disturbances associated with timber harvesting operatins. During the present site visit, a notable portion - perhaps 25% - of these koa saplings were dead, which may have resulted from competition with guava saplings before they were removed, herbicides sprayed for mitigation work, or another unknown reason.

Several apparent experimental plots had been staked out within the treated area. The October 19, 2004 status report provided by Koa Timber Inc. included GPS data for 27 of 30 plot locations that were apparently established. No corresponding map or description of plot treatments was provided to DOFAW. For these reasons DOFAW staff did not attempt to quantify the number of these plots and was unable to evaluate the appearance or effect of the various treatments presumably applied to them.

5. Discussion

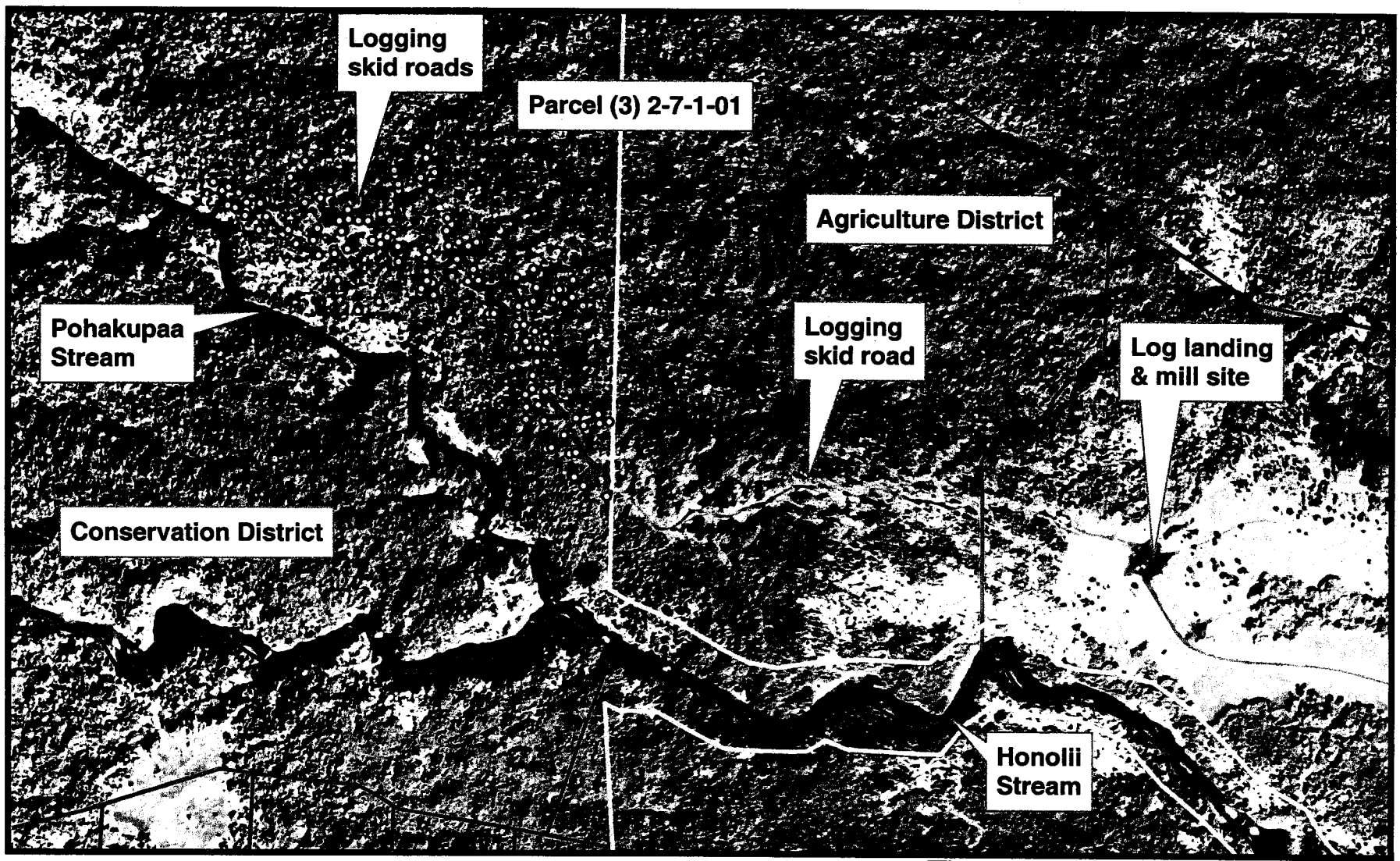
Treated area: The January 9, 2004 Board submittal described how approximately 4.8 and 13.0 acres of the subject site were impacted by skid road construction and overall logging operations, respectively. The Board-approved mitigation plan stated that koa restoration work would be focused on six of these 13 acres, and that this work area would be conducted adjacent to skid road grades. The 3.6 acres of treated area represents 60% of the six acre target. The 3.6 acres of treated area mapped by DOFAW also contained a significant percentage of skid road and skid-road right-of-way area – approximately 33-50%. The rationale for excluding the skid roads from the mitigation plan was that the koa saplings existing as of September of 2003 were already fairly well established, while additional koa regeneration was desired in areas that contained few or no koa seedlings or saplings. Koa Timber Inc. may have wished to protect and encourage growth of these previously existing saplings, but they were not intended to be the focus of the work or budget related to the mitigation plan.

Herbicide applications: Grass and other herbaceous growth has been effectively controlled by Roundup in the treated area. Garlon has significantly impacted guava stumps - some have died, while most of those surviving show signs of stress. The three additional applications of Garlon proposed by Koa Timber Inc. will likely result in effective control of this weed species in the treated area.

New koa seedlings: Since September of 2003, at least 180 new koa seedlings have germinated and begun growing in the treated area – an equivalent of 50 new seedlings per acre. The stated goal of the approved mitigation plan is to stimulate koa regeneration that averages 200 seedlings per acre. The present inspection of mitigation work comes approximately two months after the work was initiated, and it is too early to predict what additional seedling germination will occur. However, it is encouraging that natural koa regeneration is occurring in treated areas after such a relatively short time.

Experimental plots: The October 19, 2004 status report from Koa Timber Inc. states that 30 out of 48 (68%) experimental plots detailed in the approved mitigation plan have been installed. DOFAW is unsure of Koa Timber Inc. plans for the remaining 18 plots. Prior to the 12- and 24-month field inspections by DOFAW, Koa Timber Inc. is requested to provide a map and description of these plots, as well as plot GPS coordinates in digital format. The proposed treatments and associated analyses of results over the course of the mitigation period will facilitate evaluation of the effectiveness of Koa Timber Inc. management techniques by BLNR and DOFAW.

Figure 1. Location of 137 koa and ohia stumps and approximate extent of mitigation work as of November 1, 2004.



Background image source: NRCS digital ortho quarter quad color infrared
Background image date: 2/3/02.

Hawaii Division of Forestry and Wildlife
808-587-4186

October 26, 2005

Koa Timber Inc
91-188 Kalaeloa Blvd.
Kapolei, Hi 96707

State of Hawaii
Department of Land and Natural Resources

Attn: Dawn Hegger

Re: Violation mitigation report update

To: Dawn Hegger

Enclosed is a copy of the Paukaa mitigation report for your review. Please call Wade Lee at 808-896-6307 or myself at 808-358-1521 if other information is needed.
I thank you ahead of time for your cooperation.

Sincerely

Kyle Dong
President

EXHIBIT 6

Koa Timber Paukaa Mitigation
Preliminary Report Version 3
October 19, 2005

Summary

Work on the Koa Timber Paukaa Mitigation project began 13 July, 2004 and was temporarily suspended on 9 August, 2004. During this period work week hours ranged from 30 to 36 hours per week and totaled 470 man hours for the period. Travel time to the remote area from the access highway averaged 1.5 hrs\day. Including one hour for lunch, this reduced the daily work period from 10 to 7.5 hrs\day and a final actual work period of 435 man hours.

Work at the site was again conducted during the week of September 20th. Emphasis during this time period was the treatment application to the experimental plots, recording baseline conditions in the plots, counting of koa saplings and seedlings present in the cleared areas, and collection of ancillary data in adjoining non-disturbed areas.

Work at the site was again conducted for two weeks beginning June 13 2005 and extended to June 23 2005. Emphasis during this time period was focused on increasing the cleared and treated areas, counting of koa saplings and seedlings present in the cleared areas.

Current final total cleared and treated area is conservatively estimated at 6.62 acres. This represents 110% of the MOA stated goal of six acres or 147% of the actual measured site disturbed area (4.5 acres) in the Conservation area. A total of 495 man hours was dedicated to clearing the main and secondary trails or 78% of the total available work time.

The average rate of area cleared was 300 ft2/hour or 69% of the original estimated rate to treat 4.5 acres of site disturbance. The lower average rate was a function of the different methods employed and the biomass and\or stem densities in different areas of the site (ie grass vs woody plants). Clearing of herbaceous material by weedwacking ranged from 600 to 1900 ft2\hr. Clearing of strawberry guava by hand machete ranged from 200 to 800 ft2\hr in stem densities of 2 to 4 stems \ft2.

There were thirty (30) experimental plots established or 63% of the estimated number of plots (48) for adequate experimental field tests of targeted treatments. A total of 180 man hours was dedicated to establishing the experimental plots or 19% of the total work time.

Given the uncertainties regarding the design and implementation of the mitigation plan the actual work accomplished should be considered within acceptable limits of the agreed upon MOA target goals.

Continual, periodic follow-up site treatments will be required to maintain the current state of land cleared. Additional work on the experimental plots will be necessary to fully implement the treatment test design. Scheduled for the week of Dec. 5th 2005.

Results - Initial Work Accomplished

Area Cleared

Approximately 3500 linear feet (½ mile) of main and secondary skid trails were initially cleared of herbaceous grass material by weedwacking. Trail widths ranged from 55 to 145 feet for a cleared area of nearly 7 acres. Beginning at the The cleared areas initially received a herbicide application (Roundup) of 2oz per gallon of water (~2% solution rate). A second application of herbicide was applied to the entire area on September 4th 2004 and again during the week of June 20, 2005.

Experimental Plots Established

A total of 30 experimental treatment plots (35 x 35 feet) were established for a total cleared area of slightly less than one acre. The majority of the plots were established in areas adjacent to live standing trees that were observed to have produced seeds. A large majority of the plots were in areas cleared of high stem densities of strawberry guava. Each plot was marked with a GPS waypoint.

Equipment Time Trials

During the course of the work six time trials (typically 30 minutes in duration) with various hand equipment were conducted to establish average rates of ground clearing. Clearing of herbaceous material by weedwacking ranged from 600 to 1900 ft2\hr. Clearing of strawberry guava by hand machete ranged from 200 to 800 ft2\hr in stem densities of 2 to 4 stems \ft2. Clearing of strawberry guava by using a cutting blade mounted on the weedwackers ranged from 350 to 600 ft2\hr with stem densities of 1 to 2 stems\ft2.

Work Analysis

A more detailed analysis of the labor time inputs, total final treated area, and final project cost puts the results of the project (to date) in perspective to both the MOA and the preceding reports during the working discussions leading up to the MOA.

Taking together the treated areas and the area of the experimental plots produce a final actual total treated area estimated conservatively at 6.6 acres or 300,000 ft2. This represents 110% of the MOA stated goal of six acres or 147% of the actual measured site disturbed area (4.5 acres) in the Conservation area. A total of 495 man hours was dedicated to clearing the main and secondary trails or 81% of the total work time.

The lower average rate was a function of the different methods employed and the biomass and\or stem densities in different areas of the site (ie grass vs woody plants). Clearing of herbaceous material by weedwacking ranged from 600 to 1900 ft2\hr. Clearing of strawberry guava by hand machete ranged from 200 to 800 ft2\hr in stem densities of 2 to 4 stems \ft2.

There were thirty (30) experimental plots established or 63% of the estimated number of plots (48) for adequate experimental field tests of targeted treatments. The majority of plots were established along the trail grade areas in areas of high strawberry guava stem densities that could only be cleared at a average rate of 200 ft2/hour. With each plot having an area of 1225 ft2 (35x35 ft) greater than 6 man hours were required to establish each experimental plot. A total of 180 man hours was dedicated to establishing the experimental plots or 41% of the total work time.

Given all of the uncertainties regarding the design and implementation of the mitigation plan and the desire to also establish a field experiment, the agreed upon stated work to be accomplished should be interpreted as including a wide degree of variation in the final results. The fact that a large percentage of both project goals were actually achieved should considered acceptable for this particular site.

It should be noted however, that the characteristics of the mitigation site within the Conservation zone are not representative of the typical sites within the remainder of the Conservation zoned property. Caution should thus be exercised in extrapolating the current project results to the planned efforts at forest management and restoration in the wider proposed project area.

Results - Subsequent work accomplished

Work at the site was again conducted during the week of September 20th. Emphasis during this time period was the treatment application to the experimental plots, recording baseline conditions in the plots, counting of koa saplings and seedlings present in the cleared areas, and collection of ancillary data in adjoining non-disturbed areas.

Work during this period was delayed because of restricted access from a new land tenant at the upper end installing a new gate and lock without notifying others (including the USGS) of the change. This new gate changed the site access time from 20 minutes to 1 hour. Full access to the was finally regained on Sept 25th.

Work accomplished during the September 2004 and June 2005 period included the spot spraying of herbaceous vegetation (small ed leaved grassed and Palm grass) with a mixture of roundup and Garlon 4.

Previous applications have produced a good "kill" and the follow applications have extended the treatment period. Continuing follow-up applications should maintain the area free of competing vegetation with existing Koa seedlings\saplings.

Work accomplished during the September period also included the continued treatment of the

established experimental plots (13 of 30) with Garlon. Within the plots the small shoots of strawberry guava had resprouted since the initial clearing in July\August. The resprouts were again cut with a 12-blade chainsaw cutting head attached to a weedwacker. This technique worked well on the short standing resprouts allowing 100 m2 plots to be re-cleared in less than 20 minutes. Re-cut stumps were immediately treated with Garlon at a 4oz\gallon rate.

Work accomplished during the September 2004 and June 2005period also included the counting of existing Koa seedlings within both the cleared areas and established experimental plots. **A total of 1748 of both seedlings and saplings were marked along the stem or bole within designated segments of the cleared area. This total number is equivalent to 252 regenerated Koa trees per acre.** The existing regeneration represents the surviving plants as numerous dead seedlings are evident since the initial disturbance in 2000. This number will likely decrease as individual mortality continues. However **the clearing of the competing herbaceous and woody species should enhance survivability of remaining seedlings.** Continued maintenance to reduce competition for water and nutrients will also be necessary to achieve long term regeneration. The presence of a wide range of stem and\or bole diameters indicates that regeneration of Koa has been continual since the initial disturbance in 1928. **The present land clearing or disturbance will likely result in continued regeneration of new Koa trees.** Monitoring of the site over time should reveal the effectiveness of the approaches used.

Work accomplished during the September 2004 period also included the establishment of a plot transect located in an adjacent non-disturbed area. Individual plot size was 400 m2 or ½ hectre.established every 400 ft along a 2000 ft transect or a total of 5 plots. Within each plot individual Koa trees were measured for Diameter at breast Height, overall height, height to first fork and top end log diameter. Regeneration was tallied by the number of seedlings from 0 to 1 inch and 1inch to 3 inches DBH. It should be noted that no Koa regeneration has been observed outside of the disturbed areas within the mitigation zone.

Results - Planned Work Remaining

Work at the site will again be conducted during the week of December 5th 2005. Emphasis during this time period will be the continued treatment of the remaining experimental plots. Where necessary the remaining experimental plots will be treated with Garlon 4 on the resprouting strawberry guava and other non-native woody species. Plots will also be treated with Roundup to eliminate the herbaceous non-native plant species. Once the primary treatments have been applied to all plots, individual plots will be subject to applications of postemergance herbicide and\or ground scarification according to the original experimental design to test different methods of promoting Koa regeneration. Additional work will focus on recording baseline conditions in the plots, and continued collection of ancillary data in adjoining non-disturbed areas.

Datum	North America 1983	GRS 80		0	-1.60E-07	0
WP	UTM	AGZRNC	5Q		273774.8	2187114
WP	UTM	BOTSK1	5Q		273645	2187249
WP	UTM	GATE1K	5Q		280536.7	2187530
WP	UTM	GATE2K	5Q		276280.2	2187562
WP	UTM	GATE3	5Q		275582.5	2187222
WP	UTM	GATE4	5Q		274925.5	2187123
WP	UTM	MHUB	5Q		273563.4	2187421
WP	UTM	MILLST	5Q		274504.6	2187052
WP	UTM	NPLT01	5Q		273422.8	2187469
WP	UTM	NPLT02	5Q		273421.6	2187460
WP	UTM	NPLT03	5Q		273440.6	2187456
WP	UTM	NPLT04	5Q		273440.3	2187475
WP	UTM	NPLT05	5Q		273419.2	2187491
WP	UTM	NPLT06	5Q		273436.5	2187486
WP	UTM	NPLT07	5Q		273451.2	2187489
WP	UTM	NPLT09	5Q		273548.2	2187470
WP	UTM	NPLT10	5Q		273543.9	2187484
WP	UTM	NPLT11	5Q		273553.5	2187486
WP	UTM	NPLT12	5Q		273566.4	2187484
WP	UTM	NPLT13	5Q		273557.7	2187417
WP	UTM	NPLT14	5Q		273564.7	2187397
WP	UTM	NPLT15	5Q		273590	2187397
WP	UTM	NPLT16	5Q		273601.8	2187391
WP	UTM	NPLT17	5Q		273560.5	2187376
WP	UTM	NPLT18	5Q		273594.8	2187375
WP	UTM	NPLT19	5Q		273559.1	2187348
WP	UTM	NPLT21	5Q		273618.6	2187212
WP	UTM	NPLT22	5Q		273603.5	2187216
WP	UTM	NPLT23	5Q		273611	2187229
WP	UTM	NPLT24	5Q		273625.7	2187240
WP	UTM	NPLT25	5Q		273676.6	2187174
WP	UTM	NPLT26	5Q		273665.8	2187165
WP	UTM	NPLT27	5Q		273660.9	2187176
WP	UTM	NPLT28	5Q		273670.6	2187183
WP	UTM	RSPL15	5Q		273651.9	2187222
WP	UTM	RSPLT5	5Q		273698.8	2187153
WP	UTM	RSPLT9	5Q		273579.8	2187302
WP	UTM	SKRDTP	5Q		273114.2	2187613
WP	UTM	STARTP	5Q		274200.3	2187139
WP	UTM	STCONL	5Q		273705.2	2187169
WP	UTM	TOP	5Q		273476.3	2187519
WP	UTM	TOP1SD	5Q		273585.8	2187328

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
DEPUTY DIRECTOR - LAND

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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

REF:OCCL:DH

ENF:HA-04-08

JUN - 8 2006

Mark Hee
2051 Young Street
Second Floor
Honolulu, Hawaii 96826

Dear Mr. Hee,

SUBJECT: Enforcement Case HA-04-08

The Department of Land and Natural Resource's, (OCCL) Office of Conservation and Coastal Lands (OCCL) is responding to whether you may re-submit the Conservation District Use Application (CDUA) to develop a sustainable Koa Timber Forestry Operation in South Hilo, Hawaii. The OCCL notes there is an unresolved issue due to Enforcement Case: HA-04-08, and pursuant to Section, 13-5-31 (e), PERMIT APPLICATIONS, "no permit application shall be processed by the department until any violations pending against the subject parcel are resolved."

On January 9, 2004, the Board of Land and Natural Resources (Board) found that Koa Timber violated the provisions of Chapter 183C, Hawaii Revised Statutes, and Chapter 13-5, Hawaii Administrative Rules (HAR), in 139 instances by failing to obtain the appropriate approvals for unauthorized grubbing and grading; unauthorized skid/haul road construction affecting 4.8 acres; and the destruction of 137 native trees within the conservation district, and was subject to six terms and conditions. The total fine imposed, and paid was $141,000.00 (**Exhibit 1**).

A Habitat Restoration Plan was to be submitted by March 9, 2004. However, on May 27, 2004, Koa Timber submitted the Habitat Restoration Plan to reforest the affected area for Enforcement Case HA-04-08; it was approved by the Chairperson of the Board of Land and Natural Resources on June 4, 2004, and was subject to eight terms and conditions (**Exhibit 2**).

The Habitat Restoration Plan states that the "Division of Forestry and Wildlife (DOFAW) will conduct site inspections of the subject parcel in the 2, 12, and 24 month period after receiving Koa Timbers reports and before Koa Timbers presentations before the Board's scheduled land meetings. Koa Timber should submit their reports within 3 weeks of the 2, 12, and 24 month milestones, and site inspections will be within 3 weeks of these submissions."

The following actions taken by Koa Timber and the department to date are:

- The 2 month milestone from the Chairperson's approval would have been August 4, 2004-
  - Staff notes Koa Timber submitted the 2-month report on October 19, 2004.

EXHIBIT 7

- DOFAW conducted a site inspection and documented their findings in a November 10, 2004 report.
- The Board was briefed on November 19, 2004.

- The 12-month milestone from the Chairperson's approval would have been June 4, 2005.
  - Staff notes Koa Timber submitted the 12-month report on October 27, 2005.
  - DOFAW has not conducted a site inspection to date.

- The 24-month milestone from the Chairperson's approval would have been June 4, 2006.
  - Staff notes a report has not been submitted to date.

The OCCL notes as the DOFAW has not been able to conduct a site inspection for the 12-month milestone, and Koa Timber's last report for the 24-month milestone has not been submitted, the department will consider the second report as the final report, and will conduct the final site inspection on June 22, 2006. Staff will then present their findings, and Koa Timber's report before the Board regarding the restoration efforts by Koa Timber and the resolution of Enforcement Case HA-04-08. Please confirm with us whether this acceptable to you.

Should you have any questions, please contact Dawn Hegger of the Office of Conservation and Coastal Lands at 587-0380.

Sincerely,

Samuel. J. Lemmo, Administrator
Office of Conservation and Coastal Lands

c: Hawaii District Land Office
Hawaii County Planning Department

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PETER T. YOUNG
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813
TEL (808) 587-0166 FAX (808) 587-0160

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
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KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

MEMORANDUM

TO: Sam J. Lemmo, Administrator
Office of Conservation and Coastal Lands

FROM: Michael Constantinides, Forestry Program Manager
Division of Forestry and Wildlife

THROUGH: Paul J. Conry, Administrator
Division of Forestry and Wildlife

SUBJECT: Report from 24-month inspection of Koa Timber Mitigation work, Paukaa

DATE: July 31, 2006

As requested, DOFAW submits the attached report summarizing the 24-month site visit of Koa Timber mitigation work at Paukaa, conducted on June 22, 2006. Please contact us if you have questions or comments.

EXHIBIT 8

24 - MONTH FIELD INSPECTION OF MITIGATION WORK CONDUCTED BY KOA TIMBER INC. ON CONSERVATION LANDS IN THE PAUKAA AREA OF THE ISLAND OF HAWAII

Conducted on TMK parcel (3) 2-7-001: por. 001 by:

The Department of Land and Natural Resources:
Division of Forestry and Wildlife

for

The Department of Land and Natural Resources:
Office of Conservation and Coastal Lands

Michael Constantinides
Forestry Program Manager
Division of Forestry and Wildlife
Honolulu, Hawaii
July 31, 2006

Executive summary

The following aspects of work accomplished by Koa Timber Inc. (KT) in relation to principal Board-mandated mitigation objectives were observed during a site visit on portions of TMK parcel (3) 2-7-001: por. 001, Paukaa area, island of Hawaii:

1. Approximately 5.8 acres of land mechanically cleared of strawberry guava (*Psidium cattleianum*) saplings, followed by one or two herbicide application(s) for weed control. Of this total, approximately 3.9 acres of the work area occurred in the specified target location out of a goal of 6.0 acres (65% of stated objective).
2. KT installed 30 of the mandated 48 growth plots (63% of stated objective).
3. Using a combination of mechanical removal and herbicide application, KT effectively controlled strawberry guava in the treated area. Grasses also appeared to be well controlled, though their subsequent re-establishment will likely preclude any significant additional natural koa seedling germination and survival.
4. Through active mitigation efforts, KT was to stimulate additional koa regeneration on the order of 200 seedlings per acre in the treated area. Koa regeneration in the treated area that complied with terms of the mitigation plan was approximately 74 seedlings per treated acre (37% of stated objective).

1. Introduction

On January 9, 2004, the Board of Land and Natural Resources (BLNR) found KT in violation of Chapter 183C, Hawaii Revised Statues and Chapter 13-5, Hawaii Administrative Rules relating to unauthorized logging activities in TMK parcel (3) 2-7-001: por. 001. As part of the resulting Board-mandated mitigation efforts, Koa Timber Inc. submitted a site restoration plan that BLNR approved on June 4, 2002. The restoration plan established that status reports from Koa Timber Inc. and site inspections and associated summary reports from the Division of Forestry and Wildlife (DOFAW) would be submitted or conducted at 2, 12, and 24 month milestones after primary mitigation work was conducted. This report details the Division of Forestry and Wildlife's 24-month site inspection and comprises the Division's summary report on the status of mitigation work at the subject site.

2. Subject Area

The subject area lies in parcel (3) 2-7-001: por. 001 and is located approximately 5.75 miles northwest of Hilo (Figure 1). The area is forested and lies near the makai extent of the lands of Paukaa, adjacent to the confluence of Honolii and Pohakupaa streams. The boundary between Agricultural and Conservation lands has a North-South orientation in this area, and passes approximately 200 feet makai of the stream confluence. Vegetation within the subject area is primarily comprised of ohia (*Metrosideros polymorpha*) and koa (*Acacia koa*) overstory, and a mixed native-alien understory. Elevation within the area of interest ranges from approximately 1,800-2,000 feet. Average rainfall at this site is very high, probably exceeding 240 inches per year.

3. Field assessment methods

The intent of this field assessment was to observe and document the progress of Koa Timber Inc. in its implementation of the Board-approved mitigation plan. Broad objectives of the Koa Timber Inc. Restoration Plan dated 5/27/04 and approved by BLNR on 6/4/04) included: Restore native habitat; remove exotic/invasive species; and comply with Board-mandated fines and sanctions. It also stated that "*During inspections OCCL and DOFAW staff will be assessing the site primarily for the following criteria or indices:*

1. *Implementation of mitigation methodology detailed in Koa Timbers forest management plan, namely mechanical weed clearing, herbicide application, and soil scarification. Quantification by Koa Timber of the effects and efficiency of these treatments in stimulating koa regeneration is highly recommended.*
2. *New koa regeneration resulting from site preparation efforts, seedling planting, or a combination. This koa regeneration will represent a new age cohort of seedlings, and should equal or exceed the 200 seedling per acre as stipulated in Koa Timbers third draft mitigation plan. Reasonable spatial distribution of new koa seedlings for long-term growth will be viewed as an essential factor. Koa seedlings that presently exist on the site along road grades will not be included in this tally.*"

On June 22, 2006 a DLNR crew conducted a walk-through of the logged area within the Conservation District where mitigation work had been conducted. Mr. Mark Hee and Mr. Wade Lee representing Koa Timber Inc. accompanied the DLNR crew.

Garmin GPS units were used to collect a track file along the approximate centerline of treated areas, which were typically narrow corridors centered on the logging skid road system. This track file was later buffered during computer-assisted map analyses to depict a corridor width (i.e. treated area) of 35 feet – an average width estimated through field observations. These data, along with further aerial imagery analyses of the subject site, were used to estimate total area impacted by logging and total area treated during mitigation efforts by KT.

Staff also conducted a stem count of koa seedlings or saplings differentiated by the following categories: logging impacted areas within vs. outside the zone of KT mitigation work; within vs. outside of the buffered skid road system; and koa deemed to exist prior to September 2003 (date of Staff baseline data collection at this site) vs. that germinating more recently. All stem count data were subsequently increased by 20% in the office to compensate for koa regeneration that was potentially overlooked or hidden by other vegetation during the field survey.

4. Review of selected mitigation work records and final field survey results

The following discussion details principal terms of the approved mitigation plan, and the field observations and results collected to quantify how these terms were addressed by KT.

1. Restore approximately six (6) acres of lands in the Conservation District impacted by logging.

   1.1 Objective 1A: "Work will be allocated to areas impacted by prior logging operations that are adjacent to road grades that contain few or no trees. A ten (10) foot buffer from road grade edges will be used in areas that are already showing koa regeneration." *Note: BLNR agreed to compromise in that only six of 13 logging-impacted acres would be the focus of restoration efforts, but importantly, that the six acre restoration work area should be exclusive of the buffered skid road system.*

   1.2 Final field survey results: In their report dated 10/19/05, KT "conservatively estimated" a total treated area of 6.62 acres. Utilizing field GPS data, aerial imagery data and Geographic Information System based analyses, Staff estimated the total treated area to be a maximum of 5.8 acres. Similar analyses revealed that between 33-50% of the logging-impacted area consisted of the buffered skid road network. By adopting the lower percentage in favor of KT, an estimated 1.9 acres of the total treated area was comprised of skid roads, while 65% or 3.9 acres was outside the buffered skid road system.

   1.3 Mitigation outcome: KT treated approximately 3.9 acres of a Board-mandated six (6) acres of land outside the road buffered network, or 65% of the stated objective. KT treated approximately 1.9 additional acres within buffered skid road network, apparently at their own initiative.

2. Establish 48 test plots in a replicated factorial design to research and monitor best methods for stimulating koa regeneration.

   2.1 Objective 1B & Addendum A: KT will establish 48 test plots (each 10m x 10m) to research and monitor methods for stimulating natural koa regeneration, using various combinations of herbicide application and surface soil scarification.

   2.2 Final field survey results: In their report dated 10/19/05, KT stated that 30 test plots had been installed and provided GPS coordinates for these plots. Staff confirmed the field location of these 30 plots, and collected koa regeneration data within the plot areas.

   2.3 Mitigation outcome: KT installed 30 of the mandated 48 growth plots, or 63% of the stated objective. KT representatives Mr. Wade Lee and Mr. Randy Senock confirmed that these plots had been treated according to experimental design upon their installation, but had never received planned periodic follow-up treatments and monitoring due to budgetary constraints.

3. Remove exotic or invasive species from the mitigation treatment area.

3.1 Objective 2B & 2D: Using a combination of mechanical removal and herbicide application, KT will remove invasive species from the treatment area.

3.2 Final field survey results: Staff observed significant strawberry guava (Psi*dium cattleianum*) kill and suppression due to the combination of mechanical and herbicide weed control efforts by. Significant reduction of palm grass (*Setaria palmifolia*) and other grasses that were previously observed as a major groundcover components in the project area was also notable, though it is unclear if seasonal dieback of these perennial species played a role.

3.3 Mitigation outcome: Strawberry guava, a major noxious weed in the area has been effectively controlled by KT. This control was an essential step in preparing the site for koa regeneration work.

4. Through active mitigation efforts, KT will stimulate additional koa regeneration on the order of 200 seedlings per acre in the treated area.

4.1 Objective 2D: "Excluding any koa seedlings that presently exist along road grades, the goal for the regeneration of koa is to have an average of 200 seedlings per treated acre over a period of three years." Section V.2: "... Koa seedlings that presently exist on the site along road grades will not be included in this tally." *Notes: Staff first inspected this site on 7/7/03. At that time a vast majority of pre-existing koa regeneration in the logged area occurred directly on skid trails, clearly having been stimulated via soil scarification by heavy equipment. The intent of this objective was that new koa regeneration (200 seedlings per acre after summer of 2003) should be observed outside of the buffered skid road system due to either natural regeneration or as the direct result of KT mitigation efforts.*

4.2 Final field survey results: For the purpose of discussion, koa seedlings and saplings deemed to be older or younger than September 2003 are called "previous" regeneration or "recent" regeneration, respectively. Koa regeneration stem count data were analyzed in total as well as in several sub categories (Table 1). Key aspects of these analyses can be summarized as follows:

- The principal area of concern was the KT treated area outside of the buffered road system (3.9 acres), which contained an average of 74 recent koa regeneration per acre (37% of stated objective).
  - Average recent koa regeneration density within the combined 30 experimental plot areas was approximately 77% higher than the rate observed outside the plots.
  - If areas within buffered skid roads were included (all 5.8 treated acres), the average for recent koa regeneration was 102 stems per acre (51% of objective).

- If areas within buffered skid roads were included ***and*** all previous koa regeneration were added to the recent regeneration totals for the 5.8 acre area, average koa regeneration was 126 stems per acre (63% of objective).

➢ In the logging impacted area not treated by KT, no recent koa regeneration was observed outside of the buffered road system.

- In this area, recent koa regeneration was observed only within the buffered skid road system at a density of 48 stems per acre.

4.3 Mitigation outcome: KT was found to have harvested 135 mature koa from this 13-acre site for an average of 10.4 trees per acre. Generally the existing koa regeneration on the site is characterized by poor or fair vigor at best, and many of the seedlings are not anticipated to survive. Given the mitigation target of 200 koa seedlings per acre to replace 10.4 mature koa trees per acre, approximately 20 present seedlings per acre were expected to replace one mature koa tree in the future. Given the observed rates of recent koa regeneration in the KT treated area (74 or 102 stems per acre), restoration efforts may ultimately lead to replacement of 3.7 to 5.1 mature koa trees per acre in the future.

The facts that regeneration rates in experimental plots were relatively high, and that recent koa regeneration outside the buffered skid road system occurred only within areas treated by KT suggest that proactive efforts to stimulate koa regeneration have beneficial effects, but did not meet target levels in this case.

5. Qualitative field observations

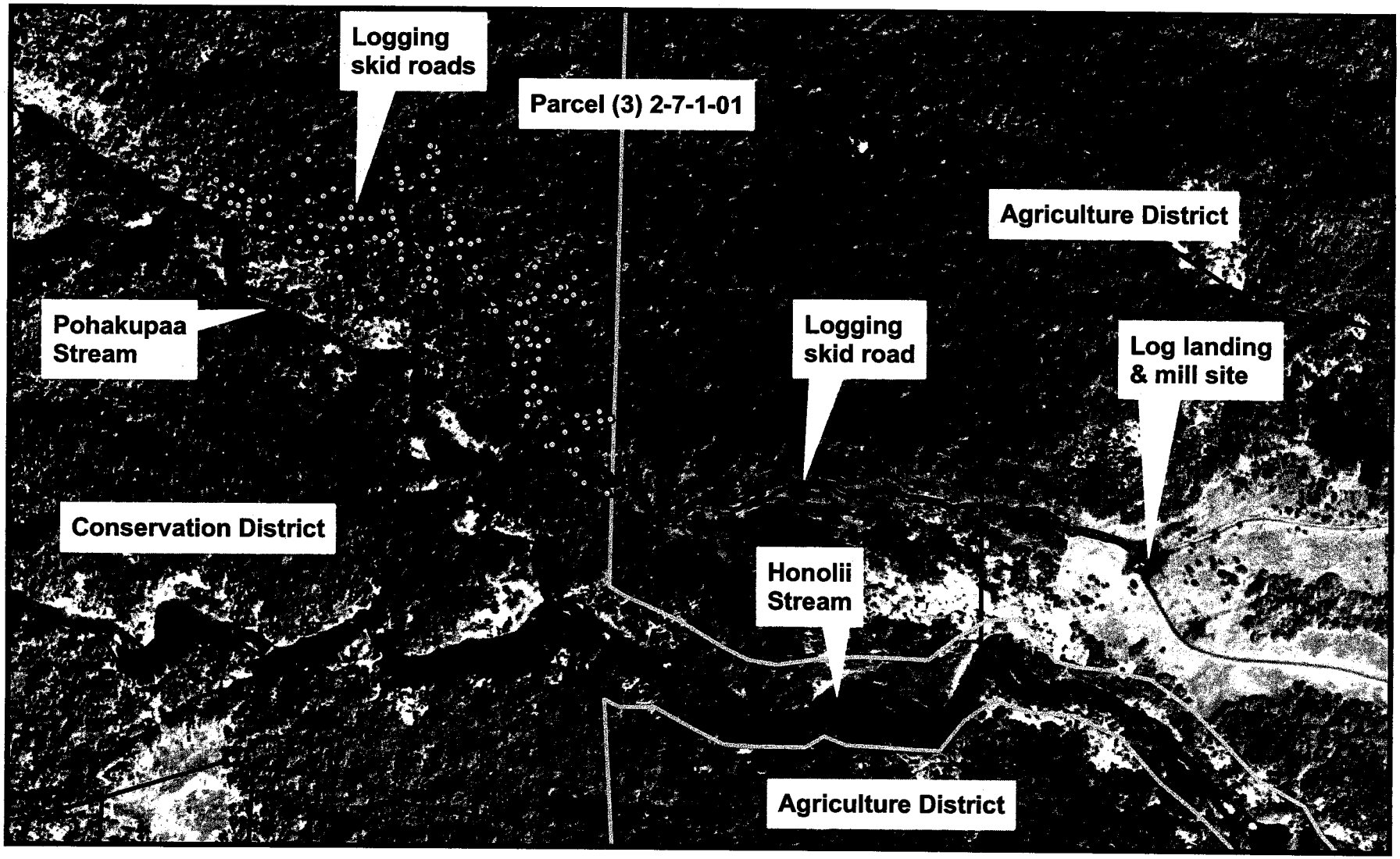
Most koa regeneration on this site currently ranges from 2-10 feet in height. A moderate amount of recently germinated regeneration (less than four inches tall) was observed. However, with no further mitigation work scheduled, the observation of notable levels of pig disturbance and the onset of uncontrolled weed competition, mortality rates in this young koa cohort will likely be extremely high.

Existing koa regeneration both within the KT treated area and the site as a whole was not uniform as stipulated. Koa regeneration within buffered skid roads occurred in densities 4-5 times higher than in areas outside the road system.

Representatives of KT indicated that mechanical and herbicide control efforts were applied twice to the skid road system, once to areas outside this skid road system, and that one scheduled chemical application treatment for the area was cancelled due to budgetary constraints. KT also did not manage or measure experimental plots due to budgetary constraints. The mitigation project budget cap of $20,000 stipulated by BLNR, and the approximately $30,000 subsequently expended by KT were not sufficient resources to achieve stated mitigation goals, illustrating the difficulty of conducting successful restoration of koa after logging on this site.

General site conditions are documented in photos provided in Appendix A.

Figure 1. Formerly identified skid road, koa and ohia stump locations.
KT mitigation work was conducted adjacent to and between shown experimental plot locations.



Background image source: NRCS digital ortho quarter quad color infrared
Background image date: 2/3/02.

Hawaii Division of Forestry and Wildlife
808-587-4186

Map date: July 2006

Table 1. Analyses of koa regeneration by area at Koa Timber Mitigation project site.

Area	Acres			koa seedling count			koa seedlings per acre		
	total	road[A]	other[A]	total	recent	previous	total	recent	previous
1 - Estimated total area impacted by logging	13.00[B]	4.33	8.67	860	704	156	66	54	12
2 - KT estimated total treated area 10/05	5.80			731	590	140	126	102	24
2.1 Inside road buffer		1.90		382	300	82	201	158	43
2.2 Outside road buffer			3.90	349	290	59	90	74	15
2.21 Inside 30 KT experimental plots			0.74	95	85	10	128	115	13
2.22 Outside 30 KT experimental plots			3.16	254	205	49	81	65	16
3 - Estimated total non-treated area	7.20			130	114	16	18	16	2
3.1 Inside road buffer		2.40		122	114	8	51	48	4
3.2 Outside road buffer			4.80	7	0	7	1	0	1

[A] Assuming a conservative estimate of 1/3 of total area = skid road

[B] OCCL Board submittal 1/9/04

[C] A 10/19/05 KT report estimated this value at 6.62 acres; DOFAW estimate of 11/10/04 was 3.6 acres, increasing to 5.8 acres as of June 2006

Appendix A: Photos from Koa Timber mitigation project site visit, June 22, 2006.: all photos in KT treated

Figure 1. Skid road grade. Good guava control in treated logged area but koa regeneration is generally sparse.

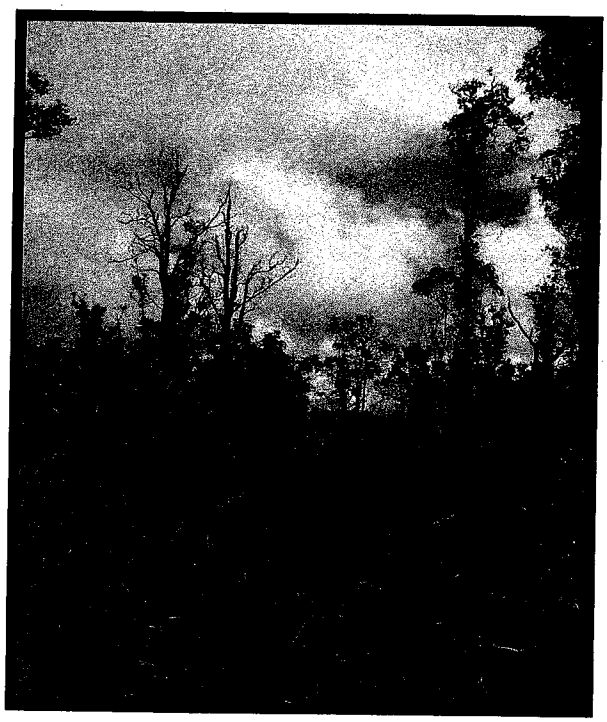


Figure 2. Good guava control, moderate levels of California and palm grasses. Two koa seedlings shown by arrows.

Figure 3. Significant additional natural koa regeneration and survival arising from current conditions is unlikely.

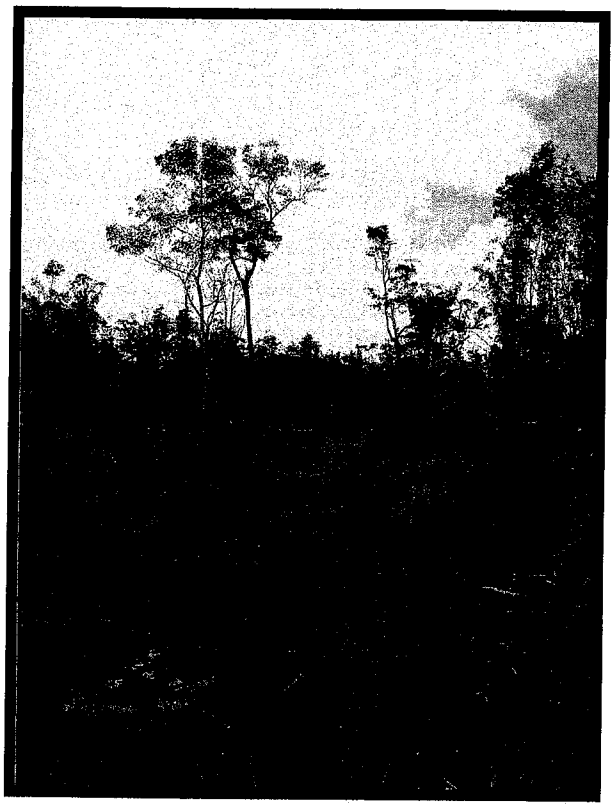


Figure 4. Koa seed germinating in area disturbed by feral pigs..

Figure 5. Three koa seedlings: two of average vigor, one recently dead (cause unknown).

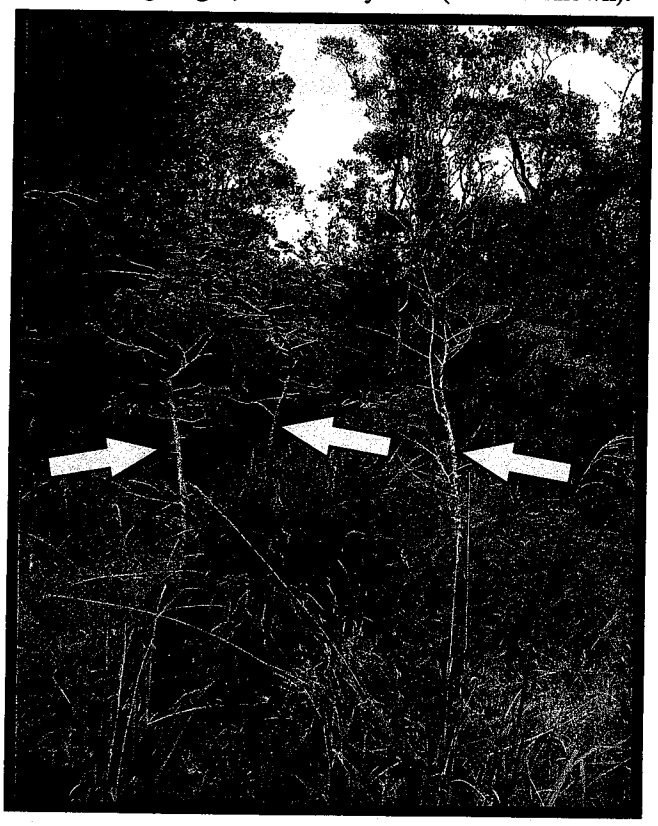


Figure 6. Guava seedlings at edges of logged and treated area are re-colonizing.

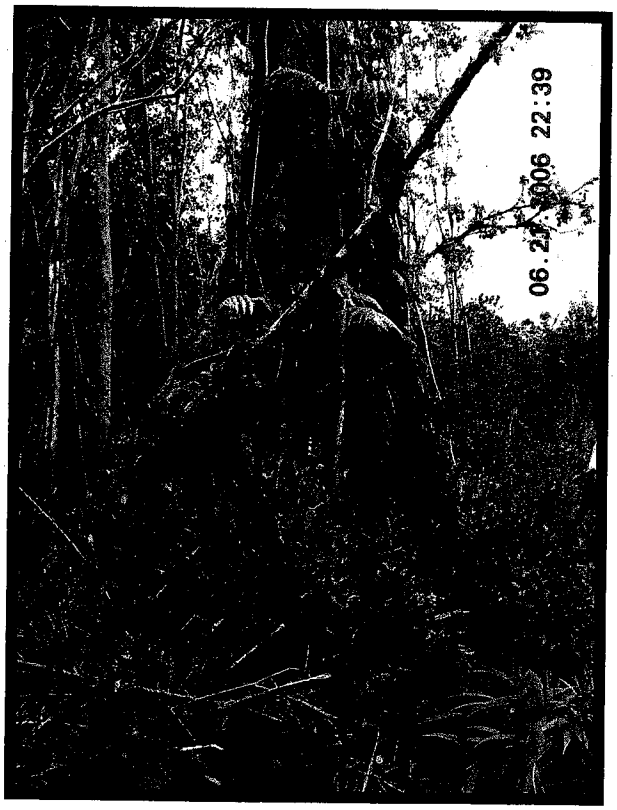


Figure 7. Koa seedling of fair vigor: approximately 50% crown dieback.

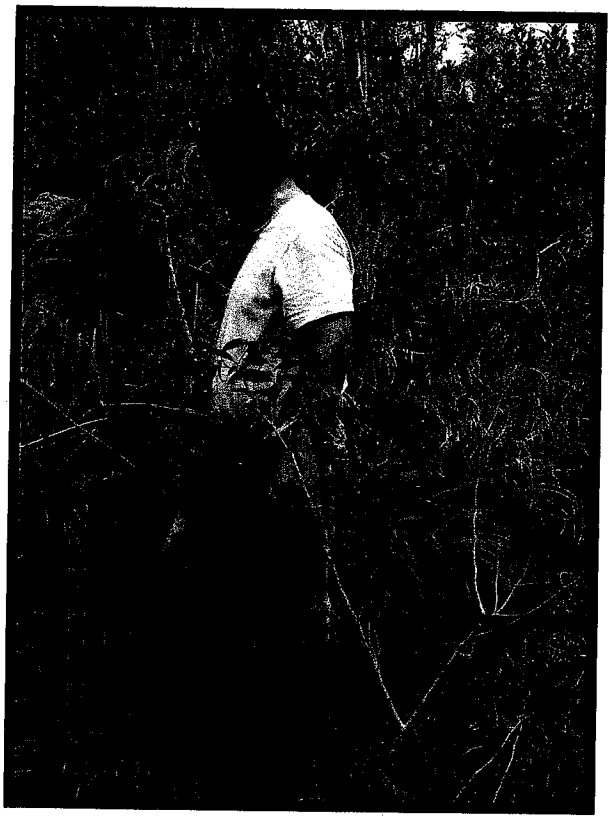


Figure 8. Koa seedling with good vigor.